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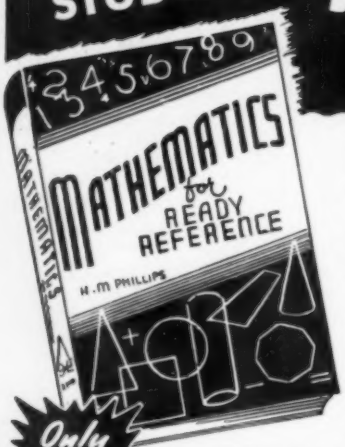

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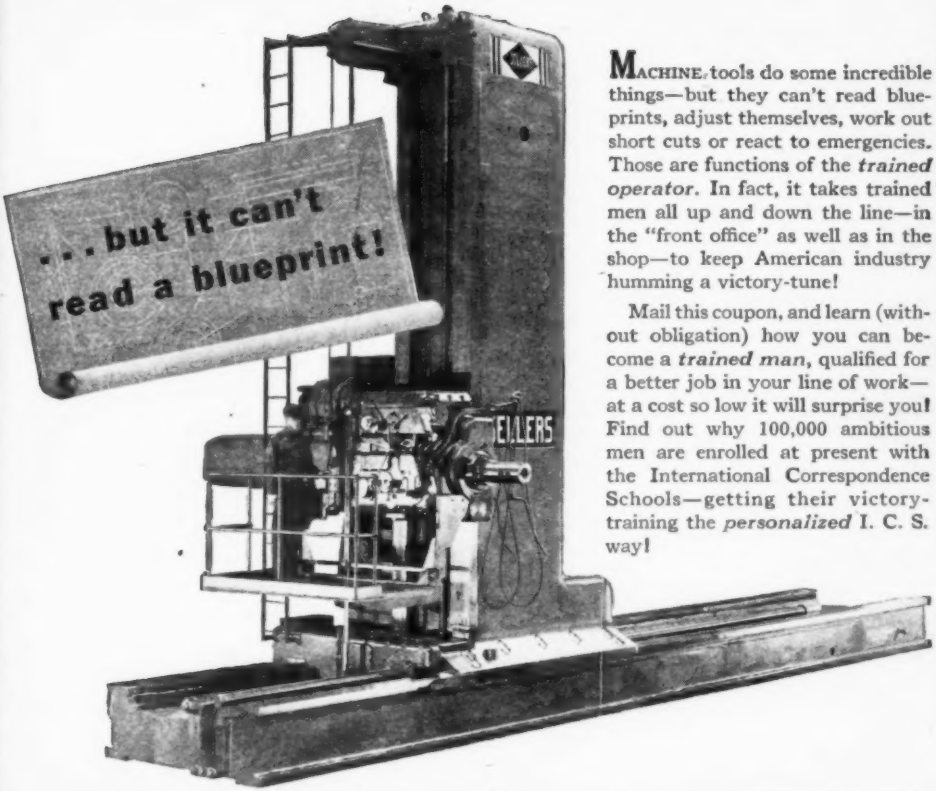

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VOL. XXIX NO. 1

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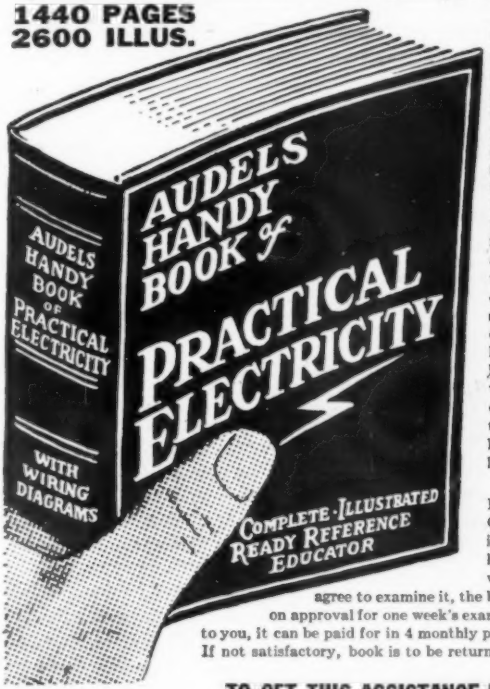
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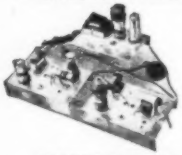

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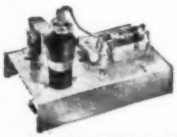

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BILL, YOU SURE HAVE A SWELL BUILD! DID YOU TRAIN FOR A LONG TIME ?
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Mail the coupon right now for full details and I'll send you my illustrated book, "Everlasting Health and Strength." Tells all about my *"Dynamic Tension"* method. Shows actual photos of men I've made into Atlas Champions. It's a valuable *book!* And it's FREE. Send for your copy today. Mail the coupon to me personally. CHARLES ATLAS, Dept. 6-ZA, 115 East 23rd Street, New York, N. Y.

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I want the proof that your system of *"Dynamic Tension"* will help make me a New Man—give me a healthy, husky body and big muscle development. Send me your FREE book, "Everlasting Health and Strength."

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JOSEPH H. KRAUS

Mr. Kraus has been giving advice to inventors for more than 20 years. He will attempt to answer as many letters from inventors as possible in his column each month. Because of the great number of letters he receives each month, he cannot attempt to send personal letters to all who write him, but must confine his replies to those which he can answer in his column. Mr. Kraus will "call his shots as he sees them" in this column. Thoroughly versed on inventions and inventions procedure, he will never, under any circumstances, disclose any valuable secrets. He cannot answer questions relating to patent law. For such information, the Editors suggest you communicate with any one of the patent attorneys who advertise in MECHANIX ILLUSTRATED.

Gas Engine and Aerial Torpedo

Ivan M. Bell, Yuma, Arizona, writes: "We have a design for an aerial torpedo on the drawing board and we would be glad to disclose the plans to Mechanix Illustrated Advisory Inventions Board.

"This torpedo is driven by a gasoline engine which the U. S. government has condemned as being impracticable, yet we have here a full-size engine which runs. It has neither valves, cam gears, cranks nor cylinder heads.

"The torpedo uses this engine and could be catapulted from an airplane. We would like to give this idea to our country."

ANSWER: *The question of accepting a new design of an airplane engine is not merely one of examining a working model. Hundreds of new styles of gasoline engines have been developed. Many have been demonstrated on the test block. But in engines, as with everything else, the inventor must reach beyond the demonstration stage. The entire structure for fabricating engines must be modified to accommodate the new design. Garagemen must be trained to make repairs. All of this requires an extensive educational program and expensive tooling up. Unless the financial status of the organization introducing such an engine is sound, the new engine soon loses prestige and disappears from the market thus undoing everything for which large sums of money were spent.*

Unfortunately, we have no definite information upon which we can base a decision concerning the aerial torpedo. The general idea for such a torpedo is not new. Controlling it remotely by radio has been discussed even prior to the advent of modern radio. On the other hand your statement that you have developed a method for "keeping the torpedo steady and level in flight" conceivably could be applied to aerial bombs or other devices.

We would recommend that you work upon the entire system and that, upon completion of your design of the aerial torpedo, you submit this to our Board for further action or recommendations.

Non-Drip Bottle Attachment

H. Jannen, Holtsville, New York, writes: "Do you still answer questions about inventions? If so, please tell me your opinion of the following which are designed to prevent the drippings from a bottle of syrup, catsup, etc., from rolling down the sides of the container."

Mr. Jannen then pictures a bottle attachment made of paper and designed to catch the drippings.

ANSWER: *Your design for a non-drip bottle attachment is so simple that we wonder why you haven't attempted to build a working model and demonstrate to your own satisfaction that it is not as practical as it appears to be at first glance. It is true, of course, that the cup-like unit will catch the drippings but these remain in the cup after washing the outside neck of the bottle. The next time the bottle is used the material caught in the cup will drip out first. Surely, you wouldn't want to have this contaminated material cover your meat or griddle cakes. Incidentally, this cup makes an excellent receptacle for the growth of bacteria. We would not recommend patenting procedure.*

Airplane Stabilizer

Walter Dowd, New York, New York, writes: "I understand that the only kinds of stabilizers which are in use today are the gyroscopic types. I have designed one which is different. Do you think it would be profitable for me to continue to work upon it?"

ANSWER: *You have given us no information upon which we could predicate a satisfactory reply other than your statement that the device does not use a gyroscope. In model aircraft, pendulum type stabilizers have been used. If your idea is based on this form of construction it is not new. However, if you have something which will work as well as a gyroscope we certainly would recommend further experimentation. A set of drawings, together with a description, should be submitted to your patent attorney for search to determine originality.*

Rubber Shoe Soles

Charles A. Smith, Honesdale, Pennsylvania, submits an idea for a new style of crepe rubber sole and heel for shoes; and he asks for our opinion.

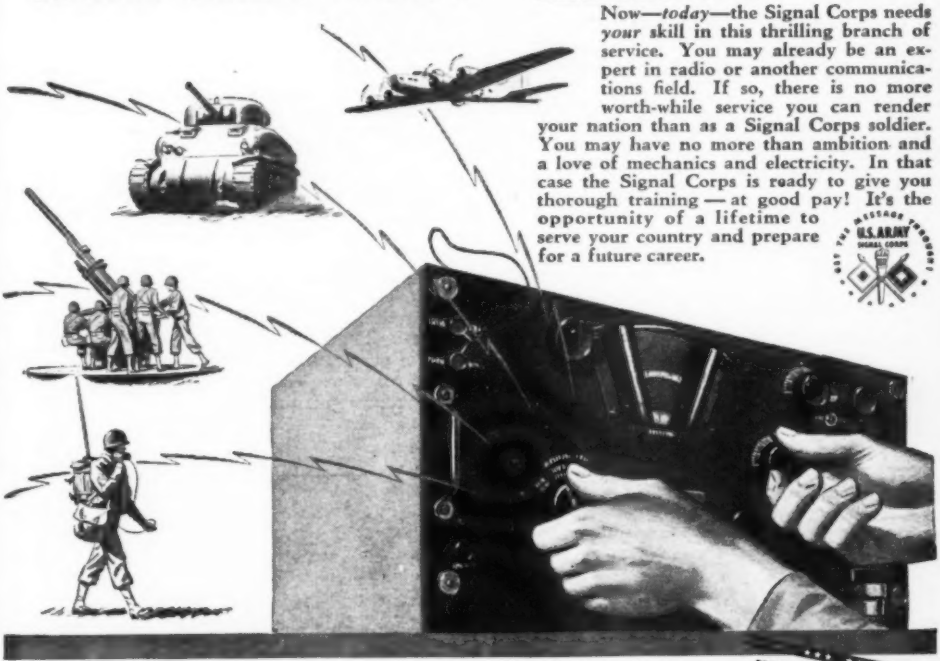
[*Continued on page* 31]

The "Nerve Center of the Army" needs your skilled hands TODAY!

This is a war of speed—a radio war. Commands and messages must go through like lightning. Never have communications been so vital to victory, or have new devices meant so much.

The whole responsibility for "getting the message through" is in the hands of the U. S. Army Signal Corps. Hands that install and maintain countless thousands of radio sending and receiving sets — hands that adjust the marvelous mechanisms of America's newest and most secret weapons—hands that flash the orders to attack!

Now—*today*—the Signal Corps needs *your* skill in this thrilling branch of service. You may already be an expert in radio or another communications field. If so, there is no more worth-while service you can render your nation than as a Signal Corps soldier. You may have no more than ambition and a love of mechanics and electricity. In that case the Signal Corps is ready to give you thorough training — at good pay! It's the opportunity of a lifetime to serve your country and prepare for a future career.



HOW YOU CAN GET IN NOW

1. *ENLISTMENT*

If you are 18 to 45 and physically fit, you may apply for enlistment in the Signal Corps or in the Signal Corps Enlisted Reserve.

Direct Enlistment: Experience as a licensed radio operator, a trained radio repairman, a telephone or telegraph worker, will qualify you for active duty at once. From Private's pay you can advance rapidly as you earn higher technical ratings—up to $138 a month, with board, shelter and uniforms.

Enlisted Reserve: If you are skilled with tools but lack qualifying experience, you may enter the Enlisted Reserve. You will be given training, with pay, in one of the many Signal Corps schools, and ordered to active duty when you have completed the course.

Commissions: Graduate Electrical Engineers may apply for immediate commissions in the Signal Corps. And special opportunities for training and commissions are open to Juniors and Seniors in electrical engineering colleges.

2. *CIVILIAN TRAINING*

If you are over 16 years of age, and even though registered for Selective Service, have not received your order to report for induction, the Signal Corps offers you an outstanding opportunity.

If you have ability with tools—if you want to secure training in the vitally important field of communications—you may attend a school in or near your home city. You will be paid not less than $1020 per year *while learning*. And when you have finished your training—in 9 months or less—you can advance to higher pay as your technical skill increases.

Even if you have a minor physical handicap, Signal Corps Civilian Training may give you the chance you've wanted to serve the Army of the United States.

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U.S. Army

• **FOR FURTHER INFORMATION REGARDING ENLISTMENT—Call and talk this over at the nearest Army Recruiting and Induction Station, or write to: "The Commanding General," of the Service Command nearest you.**

★

Or *write to:* Enlisted Branch, AD-1, A.G.O., Washington, D. C.

★

FOR CIVILIAN TRAINING INFORMATION — Call at any office of the U. S. Civil Service or U. S. Employment Bureau.

Chips FROM THE Editor's Workbench

Again, a Better MI

WHEN you turn to the editorial section of MECHANIX ILLUSTRATED this month, you're in for another pleasant surprise. Starting this month, you'll find your MI printed on improved 45-pound Superoto paper. We believe you will notice immediately the great improvement in reproduction of photographs and drawings, as well as in text.

But that's only the beginning. Next month, the size of MI will be increased to *184 pages!*

And the price will still be 10 cents!

While other magazines have been increasing their prices and cutting down on quality, MI has maintained its 10-cent price and is *steadily increasing in size and quality.*

We have been able to do this because of one fact only: You readers have been consistently loyal to MI and have been spreading the gospel of MECHANIX ILLUSTRATED to your friends all the time. This has resulted in a constant and rather spectacular rise in our circulation.

Now, MECHANIX ILLUSTRATED has *more than 300,000 newsstand circulation!*

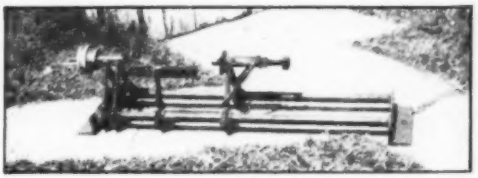
This is by far the greatest newsstand circulation of any magazine in our field.

We want to thank you readers for making this great increase possible. Please keep on telling your friends about MI. We'll keep on improving MI.

Nomination

AFTER reading the inspiring article, Mr. "We Can," on page 66 of this issue, we began wondering why, in all the current ballyhoo about Mr. Henry J. Kaiser, no one had as yet suggested Mr. Kaiser as a possible candidate for President of the United States.

Mr. Kaiser is certainly the most colorful personality to hit the news in a good many years. He has a perfect labor record. He talks a language that real Americans understand. But, most important, he gets things done, in spite of hell and high water.



Raymond R. Kramer of 728 E. Virginia Street, Evansville, Ind., offers these photographs of recent workbench projects he's completed as evidence he's a confirmed and expert workshopper. He is shown in the photo at *top right* with a buzz saw on a table he built for less than $1.00. At the *left* is Mrs. Kramer with an electric phonograph made from a cut-down radio console cabinet, Webster motor and turn-table, an old radio chassis with 1-80 tube and 1-6C5 driving a 6F6. The 6F6 feeds a 10-in. dynamic speaker. It also has a 3,000-ohm magnetic pickup. The phonograph boasts tone control, volume control, switch, and pilot light, and cost only $15.00, Kramer reports. The third photograph shows a lathe this MI reader built mostly from model T connecting rods, steering shaft, etc. It will turn stock up to 15 inches in diameter and 28 inches long; total cost was about $2.75. Mr. Kramer is awarded this month's top prize, $5.00, and a Certificate of Merit.

Editor's Workbench Chips

In case President Roosevelt intends to retire at the end of his present term, it would be hard to find a man on the American scene with more appeal.

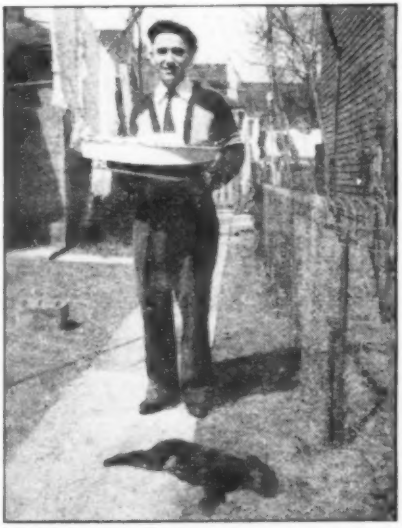
In a small whisper, then (because it's none of our business, anyway), we place Mr. Kaiser's name in nomination. Whether or not you second the motion, we think you'll get a big kick out of reading the MI story on this dynamo of the building industry.

Radio Star Workbenchers

ALL of a sudden, us workshop stiffs find ourselves in mighty fancy company. We refer to two stories in this issue, "Workshop Maestro," and "Bing Crosby's Victory Lab."

The first tells the story of Fred Waring, of the famous radio program, "Fred Waring and his Pennsylvanians." Mr. Waring, it appears, leads his orchestra for a living—but has his fun in his home workshop, even as you and I. We think you'll enjoy reading about his inventions, his home projects, and looking at the pictures of his workshop to see how it compares with your own.

Bing Crosby and his brothers, Bob and Larry, have even more extensive interest in the field of



John DeWit, of 7233 S. Peoria St., Chicago, Ill., built this PT boat from MECHANIX ILLUSTRATED plans, but that wasn't the first thing he built from them. He also turned out a nice job on the MI drill press made from pipe fittings. He tells us that he has used it many times and gotten good service from it. If the PT boat in this snapshot is an example of the kind of results he gets from his workshop tools, good service is putting it mildly. The puppy sleeping peacefully in the foreground doesn't seem to care much for workshop projects, but most dogs don't. This snapshot brings John a $3.00 Workbench award and a Certificate of Merit.

INVENTORS

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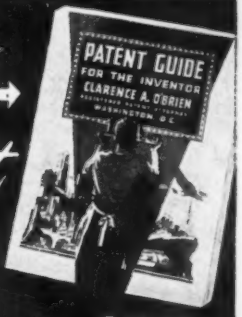

ACT QUICK - DELAY CAN BE DANGEROUS

If you have an invention—if you feel that it is commercially valuable and want to protect your rights to profit from it—send for our Free "PATENT GUIDE FOR THE INVENTOR"—NOW! For a good practical invention, plus prompt action in securing a Patent and locating a buyer or a good market, have proved the secrets of success for thousands of inventors.

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Our "Patent Guide" answers many important questions concerning Patents. It tells what facts, details, drawings, sketches, etc., are necessary to apply for a Patent; how to establish proof of your invention through dated and witnessed disclosure. We also send you our FREE "Record of Invention" Form and show you how to USE IT AT ONCE, without cost, before you file Patent Application. Our Guide also shows you how Patent Office Records can be checked to determine whether an invention is probably patentable before filing fees need be paid; discusses costs involved and a practical way these can be paid in installments as the application progresses through our office. It tells how some inventors secured financial backing; how many simple inventions proved large commercial successes; how patents covering improvements can be profitably protected and marketed; tells countless other facts of vital interest to ALL inventors.

Remember—in Patent matters DELAY CAN BE COSTLY—ACTION IS IMPORTANT. Mail the Coupon NOW—in an envelope or pasted on a penny postcard to: CLARENCE A. O'BRIEN and HARVEY B. JACOBSON, Registered Patent Attorneys, 23-L Adams Building, Washington, D. C.

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Editor's Workbench Chips

mechanics. Their money goes into a "pilot plant" laboratory where thousands of ideas submitted by inventors are tested out. After you've read of this work, we believe Bing's music will sound even better to you on the radio.

Enlisting Spare Time

YOU workshoppers and mechanics should have particular interest in a proposal we've been hearing about. Idea is to enlist spare time, to use it to train folks to be mechanics. That refers, of course, to those benighted men and women who've never before had much reason or interest in handling tools and machinery. Not many such are listed among you MI readers, we know, but your neighbors and relatives might like to have the idea passed on to them.

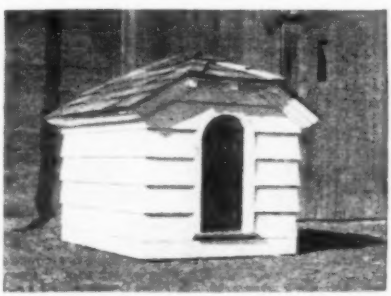
Way it would operate is this: Every town has a vacant warehouse or garage and old, worn-out motors, clocks, radios. Trainees would practice tearing down and rebuilding them. They'd grind valves, rebore cylinders, repair generators, learn to use micrometers and calipers as well.

The plan ought to build a great and growing reserve of spare-time mechanics available for jobs later in naval establishments, ordnance plants, Army repair units, or wherever needed.

Not intended for communities possessing big, shop-equipped vocational schools, the scheme would enable small towns to contribute better men to the Army when drafted, semi-skilled women to factories and war plants. Men who are spare-time tinkerers would have a big start when they get to camp and can be taught more quickly to service, operate, and repair mechanized equipment.

After the war, such men and women would be better equipped to cope with an increasingly-mechanized world, and would learn the joys and

DOGHOUSE DELUXE



This attractive doghouse was built by C. Pollard, of 9708 78th Ave., Edmonton, Alberta, Canada. It took 6 months of "off and on" work. Mr. Pollard tells us, to complete the job, and it cost $5.00 for material. A $3.00 Workbench award and a Certificate of Merit go to Mr. Pollard for this snapshot of his doghouse.

Editor's Workbench Chips

rewards of leisure spent in the workshop which you MIers already know. Get busy, missionaries!

Cover Man

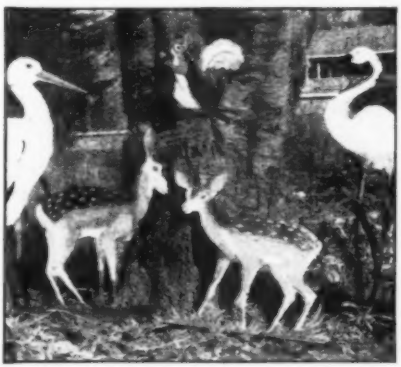
HUNDREDS of our MI readers have commented on the fine color photograph of Marine Paratroop Sergeant Roland Kachinsky which appeared on the October cover of MECHANIX ILLUSTRATED. We are sure all of you will feel personal sorrow to hear the news that this fine young man was killed in action during the Marine attack on the Solomon Islands. Strangely enough, his family was informed of his death on the day after the October issue went on newsstands all over America.

Rudy Arnold, famed color photographer, took the picture of Sergeant Kachinsky while the sergeant was in training as a paratrooper at Lakehurst, N. J. He selected Mr. Kachinsky as his subject only after he had considered a good many men in the outfit—and he selected him because he thought Sergeant Kachinsky best typified the aggressive, clean-cut Marine shocktrooper.

That Arnold had been correct in his choice soon became apparent. Only a few weeks after the picture had been taken, Sergeant Kachinsky was promoted to a lieutenancy. Lieutenant Kachinsky, because he had made 105 parachute jumps and had made such a fine record as a Marine, was assigned as an instructor.

But after a month as an instructor, the aggressiveness which Arnold had seen in Kachinsky's face made itself felt. Lieutenant Kachinsky de-

DESIGNS, SELLS ORNAMENTS



After buying a jig-saw through an MI advertisement, James E. Bennett, a disabled veteran of the first World War who lives at 923 Gordon Rd., Nelson, B. C., Canada, began making articles he saw in issues of MECHANIX ILLUSTRATED. From that he advanced to designing garden ornaments; a group cut from 3-ply-wood and painted realistically is shown in the photograph above. "The result of this experiment is that I now have more than 50 designs and have had so many offers to buy that I am going to make it a business. Thanks, Mr. Editor." As earnest of our good wishes and admiration for his designing and woodworking, we are awarding Mr. Bennett $3.00 and a Certificate of Merit.

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Editor's Workbench Chips

manded and obtained an assignment to active duty.

Soon afterward, Lieutenant Kachinsky's outfit moved to a port of embarkation and was on its way to the Southern Pacific area. Then, rapidly, came the first American offensive since the war started—the assault upon the Solomons. And Lieutenant Kachinsky was in the forefront of that historic attack.

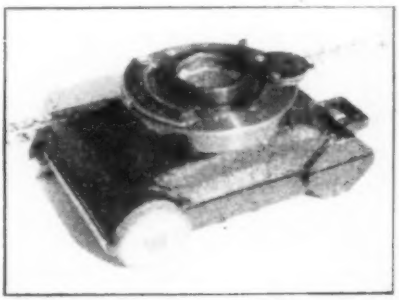
We are proud to have presented the gallant officer.

Bonds for Your Photos

THE American Red Cross has issued a call to all of MI's camera enthusiasts to enlist their talents in the war effort by helping this national organization tell its story through the medium of pictures.

Good pictures are needed to inform the American public of the greatly expanded Red Cross war-time activities, through posters, new stories, features articles, and other media. To meet this need, the American Red Cross has announced a national photo contest, with prizes amounting to $5,125 in War Bonds (maturity value) supplied by the Photographic Society of America and other friends. All photographers are eligible to compete, with the single exception of salaried employees of the Red Cross.

The contest, to be known as the American Red Cross National Photo Awards, will be divided into four parts—three monthly ones for October, November, and December, and then the Grand Finals, in which the best of the monthly winners will receive additional awards. There will be 122 prizes in all, with a top limit of two prizes adding up to $700 for one entry. Many photographs which do not win prizes will be purchased at $5.00



William S. Jarnagin, of Maryville College, Maryville, Tenn., built this camera from a 25-cent Univex and an old Eastman folding camera. He used the lens and shutter from the latter, adding one extra lens to shorten the focal length. Completed, the camera is 3 inches long, and 1⅞ inches wide. It's only 1½ inches thick. After experimenting, and computing the data on the camera mathematically, Mr. Jarnagin estimates it to be between an f:2 and an f:2.5. This is an unusual job, and brings its builder a $3.00 Workbench award and a Certificate of Merit.

Editor's Workbench Chips

each. Professional and amateur photographers, civilians and service men, are urged to submit any number of pictures. The maximum dimension is ten inches. While there is no minimum, five by seven prints are preferred.

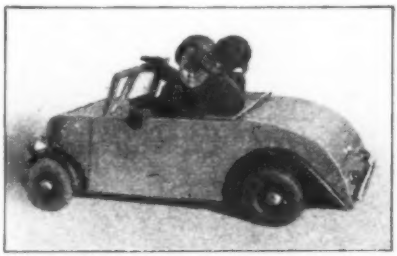
Entries should be sent to the Director, National Photo Awards, American Red Cross, 598 Madison Ave., New York. Rules Folders for the National Photo Awards may be obtained from photo dealers and photofinishers.

Keep It Up

WE GET a tremendous kick out of the pictures and letters on your workbench projects which you MI fans send us every day. We only wish we had the room to reproduce more of the photographs and quote from more of the interesting letters that describe good results using MI plans and adapting the projects and ideas in each issue to individual needs and preferences.

We're going to share with other readers some of the comments and ideas in recent letters: William Steinbrecher of Quaquaga, N. Y., sends in a picture of three lamps he recently made from scraps of metal and describes the making of them, climaxing with the statement "To give you some idea of the beauty of them I refused $30 for one on which I had spent two weeks' work."

Eugene Schneider of 694 Springfield Avenue, Newark, N. J., spent last summer making an automobile only 4 ft. high, out of Austin parts but with a body he designed himself. With an 8 h.p. engine, he averages 40 miles on a gallon of gas and can go 50-60 m.p.h. It cost him $100. "The only trouble I have is that people won't leave it alone!" he says.



Bill Sturgeon, of 259 Calumet Blvd., Harvey, Ill., built this neat little roadster for his nephew and niece. It's driven by a one-cylinder engine with a V-belt drive that keeps the speed under 15 miles an hour. The body is built of plywood, and being of box-like construction, acts as the frame too. In addition to the engine, the little car has real leather upholstery, electric lights, a working speedometer (from a bike), an ammeter, horn, brakes, ball bearing wheels, pneumatic tires, and bumpers.

Bill says he believes miniature car builders would do well to pattern their little cars after pleasure car types instead of racers, as modern designs lend themselves nicely to the little jobs. He also believes that plywood is excellent for this type of construction. This snapshot brings him a $3.00 Workbench award and a Certificate of Merit.

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WAR BONDS AND STAMPS

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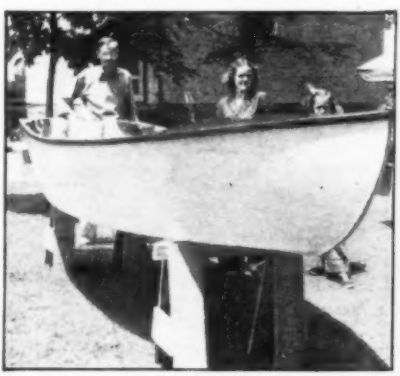
Editor's Workbench Chips

Richard Huff of 50 Harwinton Avenue, Terryville, Conn., loves to tinker in his brothers' workshop, he writes, sending along a photograph of an all-purpose tractor his brother-in-law built—his sixth! He chained the tractor to a rock and let it "rear" with front wheels in the air while the photo was snapped. Richard is saving toward an engine for a motor-scooter as he "lives quite a ways from town and could use one." He looks for the Workbench first every month, he says, because he likes to see what other readers are building.

"Popcycle" is the name C. C. Newton of 79 Cooper St., Charleston, S. C., gives to motorbikes! Apt, isn't it? His was the first one made in his city. A friend gave him the motor and he got the parts from junk yards; his costs were only $15, but he's been offered as much as $150 for it! No wonder he says he's made five since the first one! He's ridden that one 875 miles without trouble.

As indicated by the page of photos of them from readers in last month's MI, motorbikes continue to be the project most popular with you MIers, these days. Motor-scooters, too, of course—since both help people in areas where gas is rationed to cover greater distances within the limits of their allotment. Slick motor-scooter jobs have recently been submitted to us in photographic record by Allen Streitmatter of 318 W. Sciota Street, Peoria, Ill., and by Steve Milkovich, Jr., of Cresson, Pa., who built his scooter at Meadowlands, Pa., when he lived there.

HIS FIRST JOB—AND SWELL!



"*Bingo* is the first boat I ever built and it turned out to be a swell job," writes William Hickman of 1327 E. Rittenhouse Street, Philadelphia, Pa., enthusiastically. Plans for this popular plywood dinghy appeared in the October 1941 MECHANIX ILLUSTRATED. "It is powered with a 2½-h.p. outboard and does very nicely. I could have sold it a dozen times already. The plans in MI are so simple that anyone can build from them. The boat is 11 ft. 4 in. long and 4 ft. wide and seats five comfortably." Mr. Hickman's good work with building a replica of *Bingo* not only has earned him a lot of enjoyment but our $3.00 award and a Certificate of Merit.

Editor's Workbench Chips

Another motorized wheeled gadget that many readers are building and enjoying is the lawn mower, as indicated by a continuing stream of photos and letters about it. Among the latest we've received and admired are from Rev. Walter Harriman of Hays, Kans., and C. W. Smith of Eufaula, Ala. Mr. Smith writes that the big utility company for which he works had never been able to obtain just the grass-cutter needed for use on the grounds of their large sub-station—until Mr. Smith saw plans in MI for just the thing. "Due to our rigid safety rules, several safety features are combined. The blade is completely enclosed, to keep it from throwing foreign objects out. A polarized line is used, necessitating a polarized plug and receptacle. The frame of the machine is grounded to this line which eliminates the electrical hazard."

Bruce A. Moyer of 57 S. Second St., Emmaus, Pa., has "been reading MI for four years and decided it was about time I put in my two cents worth commending you on the fine mag you have been putting out. I like the home workshop department the best and would like to see more models. Keep up the good work." Moyers' liking for models is evidenced by the photo of a good model he inclosed: the MI Whirlwind which he clocked at 37 m.p.h. on a tethered track. It runs on wheels from a rear wheel drive car. He says, "I also made a pair of wheels from a rubber-tired ash tray and babbitted my own bearings in them. These wheels are 4½-in. in diameter and increase the speed to 48 m.p.h. Altogether, including the

BUILT PADDLE BOARD & CARRIER

Ralph Lewis of 809 Holland Avenue, Wilkinsburg, Pa., built this paddle board from his own design. It's 8 ft. long and 2 ft. wide and about 3½ in. deep—yes, inches! That means Lewis probably never has had a dry ride on the boat but it must provide a lot of fun during swimming sessions and other summer water sport periods—good return on his $5.50 investment, right? Lewis also built the car-top carrier for transporting the paddle board to and from the river near his home easily. For his design ability, workmanship, and good photograph Lewis earns a $3.00 award and a MECHANIX ILLUSTRATED Certificate of Merit.

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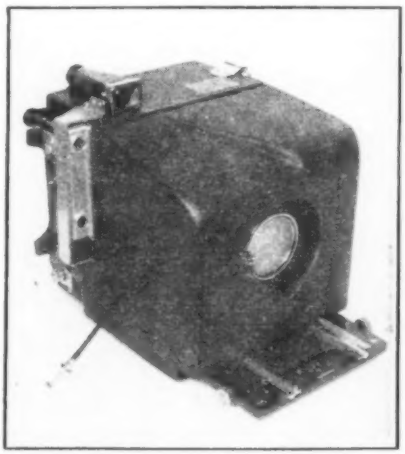
Editor's Workbench Chips

motor, my Whirlwind cost $15.71. This may at first seem high for an air-driven car, but when the many joyous hours of running it are considered it pays for itself over and over again."

Move over, you men, and give room for an energetic and talented woman workshopper, Mrs. Ethel Davidson of Woodlawn, Va., who sends in photos of three items she's recently built. Wood from a powder box was used in making a three-shelf bookcase and an end table, Mrs. Davidson writes. The third project is "a bird bath" made from an old light reflector, clay pipe, and a little cement. On your toes and at your workbench, fellas, the gals will be giving you a run for your lathe!

Speaking of box boards, M. C. Buswell of 1812 Cambridge drive, Alameda, Calif., describes his making a modern typewriter desk from them, using plans which we published in February, 1937. "Most of it was made of ordinary box boards," he says. "When a packing case came into the print shop where I work I would look it over for clear-grained boards. Then in my spare time I would glue two together, using dowels, and cut them down to size on the shop saw. It was slow work

WINDPROOF COVER FOR CAMERA



One of the best photographs received in a month from photography hobbists and simple "snap-shooters" is this clear, sharp picture of a regulation Speed-Graphic fitted with a windproof cover. The cover and the photograph were made by Tech. Sgt. Leo H. Gille, 86th Material Squadron, Army Flying School, Columbus, Miss., who is awarded a $3.00 check and a Certificate of Merit for them. Originally designed for aerial photography the cover has proved satisfactory not only for that use but in taking pictures while riding at high speed in open autos, motorboats, motorcycles, or any other situation where the bellows is subjected to heavy wind blasts.

The cover is held to the camera by one screw in the tripod screw hole under the side strap handle and may be placed or removed in a few seconds with any camera alteration. Lens and shutter adjustments are made through the front opening. The top is so shaped that full vision is obtained through the viewfinder.

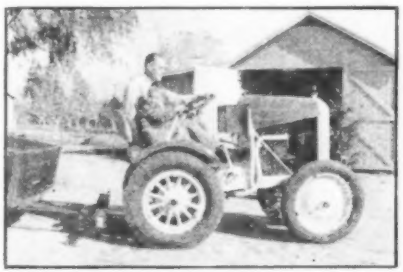
as packing cases are not made of the wood they used to be. I had to make the doors of ¾-in. plywood as the hinges wouldn't hold in the box wood. Though it took some time to make, I am more than pleased for it is just what I needed."

Land Catapult For Planes

A PORTABLE, trailer-carrier catapult, for launching land planes as similar shipboard apparatus launches flying boats and pontoon-equipped planes, is the potentially war-useful invention on which U. S. patent 2,292,374 has been granted to Paul G. Hagenbuch of Arlington, Va. It will enable army commanders to launch planes from close behind front lines, the inventor points out, for it will no longer be necessary to find and clear even a small emergency landing field for a take-off run. Mr. Hagenbuch's invention differs very little from the long-familiar ship's catapult, except that the runway folds in hinged sections for convenience in "march order." It is intended primarily for truck towing, though there is no reason why it should not be mounted on a railroad flat car.

There is no reason, either, why it should not be used in conjunction with a landing field. The latest aircraft carriers in our Navy have catapults as well as runway space on the top deck, so that several planes can be launched at the same time. Similarly, several of these land catapults could be ranged around the sides of a landing field, ready to pop their planes into the air on a few seconds' notice, while others are racing down the runways. It could also be mounted on top of buildings in cities, to send up interceptors.

TRACTOR "MASTERPIECE"



This bantam tractor is his "masterpiece," says Homer D. Baker of 1591 Glasgow Avenue, San Bernardino, Calif. It's 3 ft. wide, 5½ ft. long, with six speeds forward and two in reverse, and speeds ranging from two to 60 m.p.h.! It has a hand-operated cultivator bar attached to the back (see photo) and can also pull a 5 ft. disk cut down from an 8 ft. 4-piece Case disk. The tractor is built from a '28 Chevrolet motor and a model T Ford Ruxtel rear end coupled direct—no drive-shaft between. "The motor has hardly more than to idle to pull any load I have for it, and uses about ¾-gal. gas an hour. This tractor and attachments have kept my two acres looking better than any around here for two years without giving a bit of trouble." Mr. Baker's project wins him a $3.00 award and a MECHANIX ILLUSTRATED Certificate of Merit.

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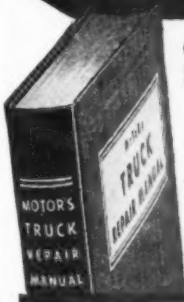

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Editor's Workbench Chips

The inventor sees another possibility, in the launching of radio-controlled planes or radio-steered aerial torpedoes—craft as yet only in the earliest experimental stages.

He states that the United States government may manufacture and use his patent without payment of royalties.

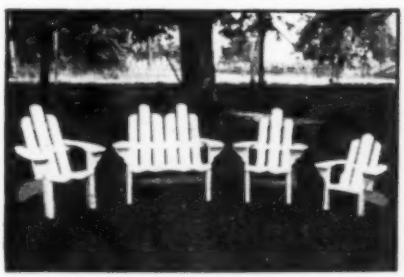
New Primer Uses Lead

A NEW primer for setting off explosives, whether commercial or military, that substitutes salts of lead for the now hard-to-get fulminate of mercury is the subject of patent 2,292,956, granted to J. D. McNutt and S. D. Ehrlich of New Haven, Conn. The lead salts used are lead hypophosphite and lead nitrate. To this are added trinitroresorcinate and sodium hydroxide. The ingredients react in water to form a double salt, lead styphnate and lead hypophosphite, which is stated to be a satisfactorily sensitive primer. Rights are assigned to the Western Cartridge Company.

Stronger Shells By New Method

A NEW method for making artillery shells stronger and better able to withstand the terrific basal push they receive as they are fired, is covered by patent 2,292,928, obtained by William C. Coryell of Youngstown, Ohio. Mr. Coryell starts with a forged blank of a deeply bell-shaped pattern. He rolls the flaring skirt down to the caliber already given to the head, at the same time twisting it. This, he states, adds greatly to the strength of the metal near the base.

$4 START LEADS TO ORDERS



Plans from a recent issue of HOW TO BUILD IT were used by 14-year-old Dan Grummett of RFD 2, Seaforth, Ontario, Canada, when he made this attractive set of lawn furniture in his home workshop last spring. He figured out adaptations of the basic chair plan in constructing the double chair for his parents' use, and the child-size chair for his little sister. To conserve materials in war time, Dan used very little new lumber; the approximate cost of the whole set was under $4.00. He writes, "Already I have received an order for two single chairs and have many interested inquiries." Looks as if he'll have a business on his hands! A $3.00 Workbench award goes to young Grummett, plus a fine Certificate of Merit to attest to his energy, ingenuity, and craftsmanship.

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Your Invention Clinic

[*Continued from page 12*]

ANSWER: *Developments incurring the non-war use of natural rubber should be kept on paper at least "for the duration." Whether or not America will have a supply of crude rubber within the next few years will depend upon what happens to rubber plantations and transportation.*

Nevertheless, if you and your friends have discovered that the system which you propose really possesses the benefits you claim for these soles and heels we would most assuredly recommend patenting procedure. We are not convinced that the method you outline possesses the listed qualifications. But because we believe that your idea possesses considerable merit we are not disclosing the details. This conforms with our long-established policy.

Selling an Unpatented Invention

Martin Fleischer, Brooklyn, New York, wants to know whether unpatented inventions can be sold.

ANSWER: *Of course! Many inventions are sold that way. All war industries today look to their employees for ideas to speed up work or improve the quality of the materials turned out.*

However, when attempting to sell an unpatented idea you must be able to trust the person (or organization) with whom (or which) you are dealing. The safest procedure is to have a patent. Then, you know what you are offering for sale and the buyer knows what he is expected to purchase.

Book Matches

A. M. Leighton, Arlington, New Jersey, submits a sample of book matches, the nature of which is made clear in the reply.

ANSWER: *The idea of placing the striking surface on the back of a book of paper matches is as old as the proverbial hills. We are confident that you could not get a patent on this modification. As a matter of fact, many such match books have been produced and you will frequently come across some of them if you start a match book cover collection.*

Adjustable Pipe Wrench

Gilbert E. Rowe, Mooers, New York, sends us a sketch for an instantly-adjustable pipe wrench and asks us to express an opinion of value.

ANSWER: *The instantly-adjustable pipe wrench*

[*Continued on page 32*]

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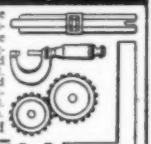

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Your Invention Clinic

[Continued from page 31]

which you have "designed" is an inferior modification of an adjustable wrench which the writer has had in his possession for more than 25 years. There is a difference in the jaws. But your design does not insure a grip.

We are doubtful that you could get a broad and basic patent on this construction. We also question the advantage of such a wrench because adjustments in this form of a device can be approximated only. We recommend that you carry the general thought further and develop it experimentally before applying for a patent. It is conceivable that a speedily adjustable wrench could be developed. This should give the delicate control and strength of a Stillson wrench with the desired speedy operation.

Improved Clothespin

Henry C. Wetzel, Old Zionsville, Pennsylvania, submits a design for a new style of clothespin which he claims is superior to the conventional style under "test" conditions.

ANSWER: *We have no way of determining how you made your test. Obviously, the same amount of force should be applied to clothespins of identical leg tension. These should be applied to the same cloth hung over the same line for precisely the same overlapping distance. Traction on the cloth might then indicate whether your form of clothespin is superior. We bring out these points primarily because too many of us are prone to accept "proofs" which would not stand up under real test conditions.*

However, your idea does appear to possess a distinct improvement over present-day clothespins and it is for this reason that we have not disclosed the details.

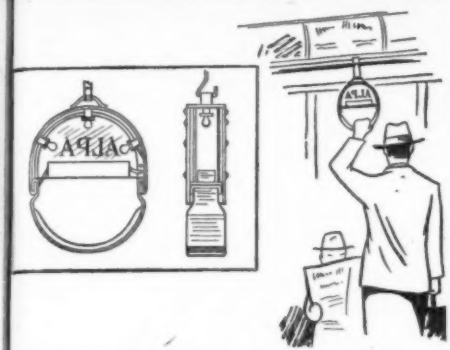
It is not likely that you can do anything with this system at present nor could anyone today tell you just when such a clothespin could be manufactured because it employs strategic materials in its manufacture. It may be that one of those strategic materials will become so inexpensive after the war that the entire clothespin, instead of merely a portion thereof, could be made from that material. This might be a further improvement.

Our recommendation is that you shelve this idea "for the duration" but proceed further as soon as the international picture has changed.

Instead of drawing wire, a new process turns out wire, flat and angled as well as round, by slitting the metal into sheets.

Pyrethrum, used in insecticides, has no strong odor, and apparently attacks the insect's nervous system to do its work.

New Products And Inventions



Strap hanging subway riders may soon be turning on their own advertisements if a patented device designed by Viktor Ehrenhaft of Prague, Bohemia, is adopted in this country. According to the invention, the grip includes an advertising unit whose lights are switched on and off by pulling on the grip portion of a strap hanger. (No. 2,277,088.)

* * *

Several Flashes From One Bulb

Photographers find it a good deal of a nuisance to change flash bulbs between "shots." This difficulty is at least partly eliminated in the invention patented (No. 2,290,309) by John Aquilla of Brooklyn. He has designed a multiple bulb, in two or more separate sections one above the other, so arranged that the foil or filament in each section may be fired separately and successively. Thus the photographer is able to make as many flash exposures as there are sections, before he needs to take the spent bulb out of the socket and insert a fresh one.

* * *

Synthetic Chewing Gum

The Hercules Powder Company is also assignee to rights in patent 2,286,712, obtained by Joseph N. Borglin of Wilmington, Del. On the surface at least it looks like a rather odd interest for a powder manufacturing concern, for the invention consists of a synthetic chewing gum, described as a mixture of polymerized rosin and polyhydric alcohol esters. Need for something of the sort seems to arise from the scarcity and high cost of the natural raw material for chewing gum, chicle, obtained from tropical American trees. Just as difficulty in obtaining natural rubber is forcing development of synthetic rubber, so apparently is the scarcity of chicle necessitating the development of an "ersatz" material, too.

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BOAT: *Frisky, left,* is a popular 17-foot Marconi rigged sloop that can be constructed of non-defense materials. *Blueprint No. 972, $2.50.*

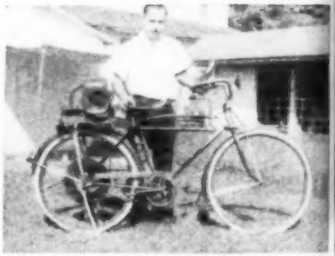
BOAT: *Above* is *Sportster,* a speedy 12½-foot outboard runabout. Will take any motor of from ten to thirty h.p. *No. 978, $1.50.*

MODEL: Build an accurate scale model of one of the U. S. Navy's "T" Class submarines, pictured *below.* Plans include full-sized templates for hull. *Blueprint No. 336, Price $1.50.*

MODEL: An electrically driven replica of the famous M-3 General Grant tank that maneuvers like the real thing by remote control. *No. 337, $2.00.*

MODEL, *below:* Here's an action model that will give any boat model fan the thrill of a lifetime. You guessed it—a 26-in. model PT motor torpedo boat like the one Lt. Bulkeley smashed the Japs with. Completely detailed and powered with a midget gas engine. *Blueprint No. 330, Price $2.50.*

MOTORBIKE, *right:* The answer to rubber and gas rationing. If you own a bicycle you can install a small motor that will push you comfortably along on practically no gas! Plans show two types of installation, and include a bike sidecar. *Blueprint No. H-82, Price $1.00.*



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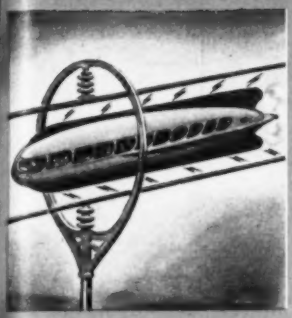
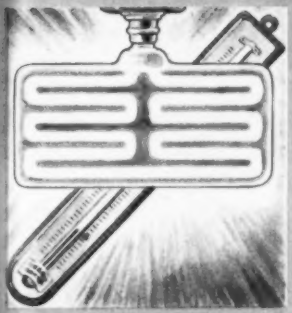


Right: Magnetic field holds screwdriver suspended in midair at Westinghouse laboratories. Similarly, magnetism might be used to suspend a train *(above)* for frictionless transportation.

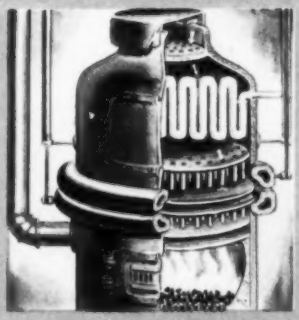


A fortune awaits him who devises a means to produce cold light. Now 92% of light energy is used up in heat.

The World's 10 Most Needed Inventions

by Raymond F. Yates

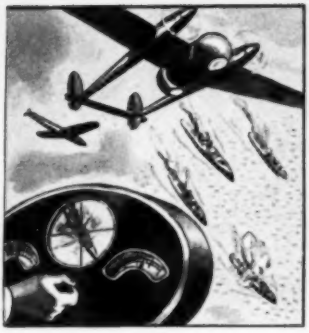
At present, we waste the greatest part of the stored up energy when we try to turn coal into power. If we could turn coal directly into power, possibly by reaction of two types of metal to heat and cold *(right)* we could save 30 to 80 per cent. *Far right:* A battery to convert sunlight directly to electricity would bring wealth to the inventor.



PRACTICALLY every machine and device that we have in the world today will eventually have to be invented all over again. That may sound a bit pessimistic to those who are convinced that we live and move in a wonderful age. It is an age of wonders, perhaps, but it is very far from an age of efficiency.

With scarcely an exception, all of the machines we use are crude and inefficient and only partially developed. Our locomotives use but 8% of the energy in the coal fed to them, and our automobile engines convert but 18% of the power in gasoline. Electric motors, washing machines, refrigerators, and even common household scissors, are used every day and yet they remain but crude representations of the things they really *ought* to be. We need better, simpler and less wasteful articles—less wasteful not only of energy, but of human time and human labor.

The klystron already broadcasts power, but a more efficient device for transmitting energy is a needed invention.

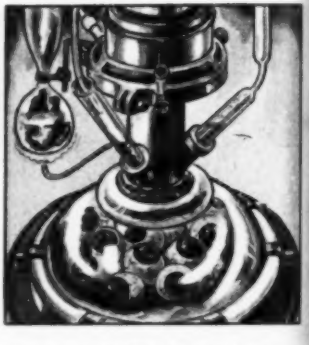


We need better mechanisms for controlling devices remotely by radio. The field of electronics is extremely promising.

Greatest possibilities for the future lie in the field of transmutation of matter. Cyclotron is already accomplishing this.

Anyone who can invent a vest pocket television receiver will reap a fortune after the war. "Walkie-talkie" is needed.

Physicians need an X-ray machine that is highly mobile and can be carried in an ordinary medical kit, as shown above.



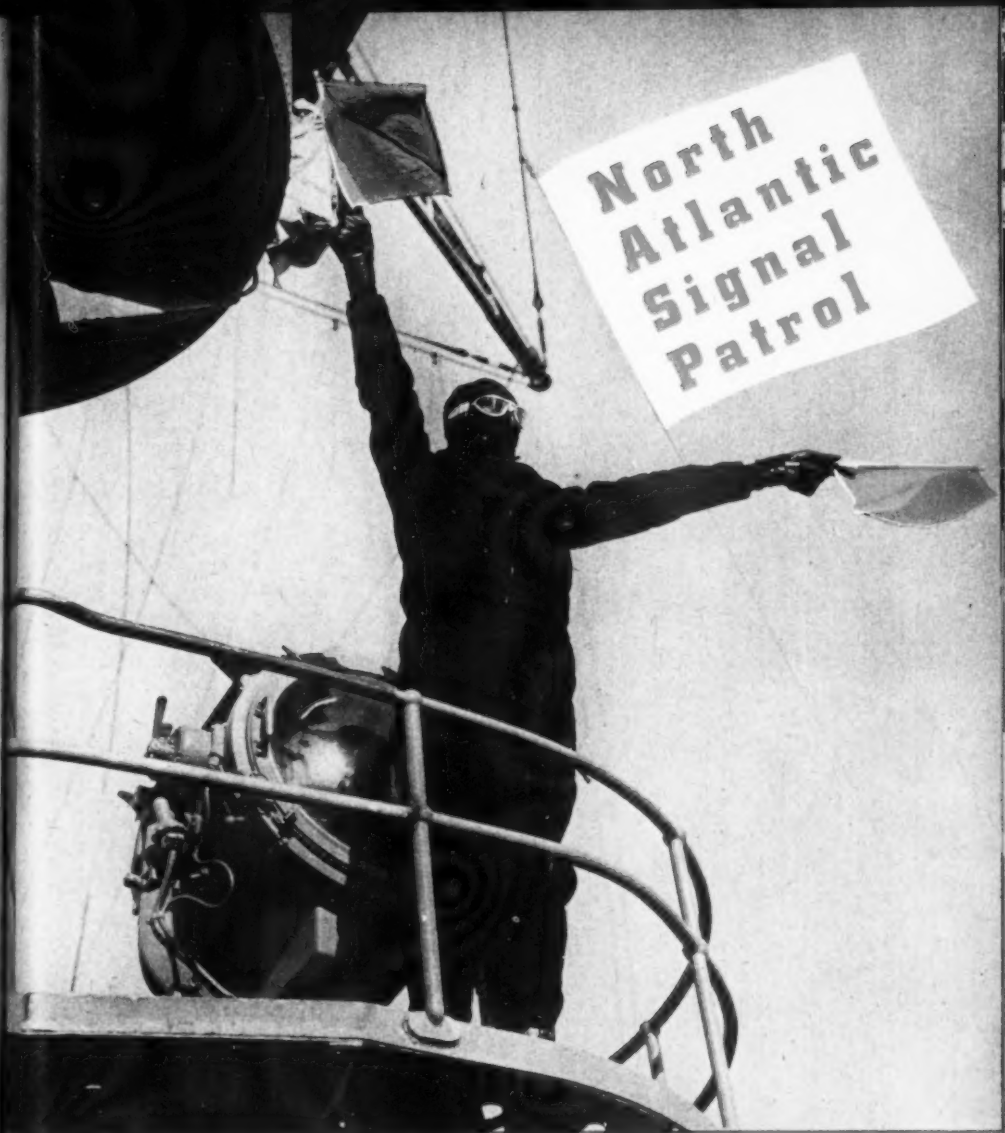
One of the greatest boons to humanity would be a way of keeping human eyes alive so they could be transplanted.

The inventor setting out to solve a problem should not allow his mind to be shackled by tradition or conventional manufacturing methods. He should make every effort to develop an entirely *new* article, new in principle, new in results achieved. The man who first perfected the carpet sweeper did not try to produce a gadget which would duplicate the motion of the human arms in brushing a broom over the floor. He thought of a new principle, the principle of rotating brushes that would automatically force the dirt up into a small compartment.

The field for invention is far greater today than it was fifty years ago because we not only have new and better tools and materials to work with, but we also have a public that is quick to see, to understand and to buy the better thing. The world, and especially this country, has become science-minded. Yet the person who thinks we live in a truly scientific world is to be pitied. There is a real, almost desperate need for [*Continued on page* 157]

Raymond F. Yates (right), author of this article, is also author of a new book just published by Wilfred Funk, Inc., New York, entitled, "2,100 Needed Inventions." This book is composed chiefly of a list of suggestions for inventions, any one of which would make a fortune for the inventor. Mr. Yates is perhaps best fitted of any man in America to write on the subject of inventions, being head of a highly successful firm, himself, and having been a writer and research man in this field for nearly 25 years.

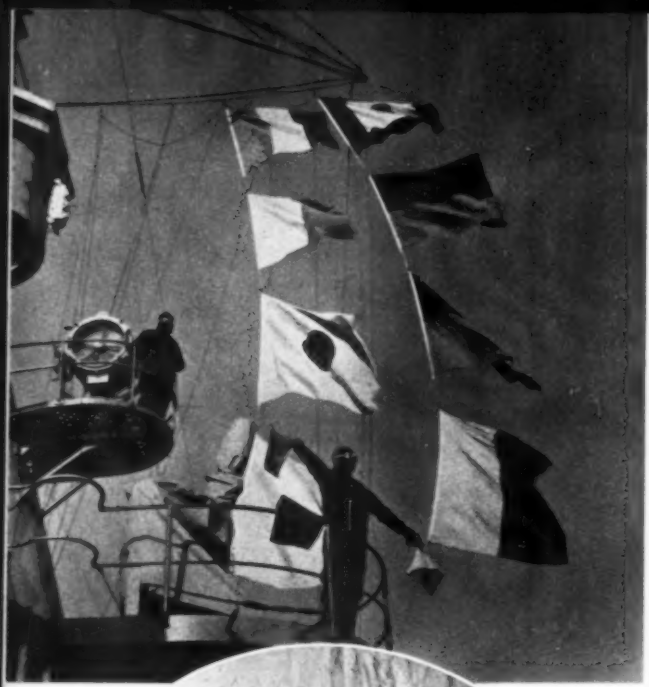
North Atlantic Signal Patrol



Silent signaling methods, like wigwag, remain unchallenged by radio in convoys. Broadcasts would reveal positions to enemy.

OCTOBER sun, bright but without warmth, glitters on the crests of waves far out in the North Atlantic's lanes of sea traffic. It throws lengthening shadows behind a horde of drab merchant ships, emphasizing the geometric pattern of the convoy formation, and sinks into the unreflecting gray of sleeky powerful U. S. Navy warships shepherding the defenseless cargo vessels. It leaps toward a black-robed figure manning a device like a searchlight that's been stopped down with a small-lensed cone, and is flashed in swift dit-da-dit of Morse code. Answer winks back from another sun signal machine on a cruiser forward in formation. The North Atlantic Signal Patrol is at work!

In a moment a brother to the Captain Midnight-like figure on the cruiser steps near the rail of a balcony that juts from the superstructure, begins to wigwag signal flags—the



red and white of them sharp as fire in the morning light—in a peremptory warning to an overeager merchantman. Impatient of the slow pace forced on him by his older companions —speed of an entire convoy is dictated by the maximum of its slowest member—he had gradually slogged ahead of his allotted place. The Navy crews are alert night and day to correct just such intended or accidental breaks in the convoy pattern. That pattern must be maintained. If it isn't, torpedoes launched by lurking Nazi subs at no particular ship in the assemblage are apt to become "lucky hits."

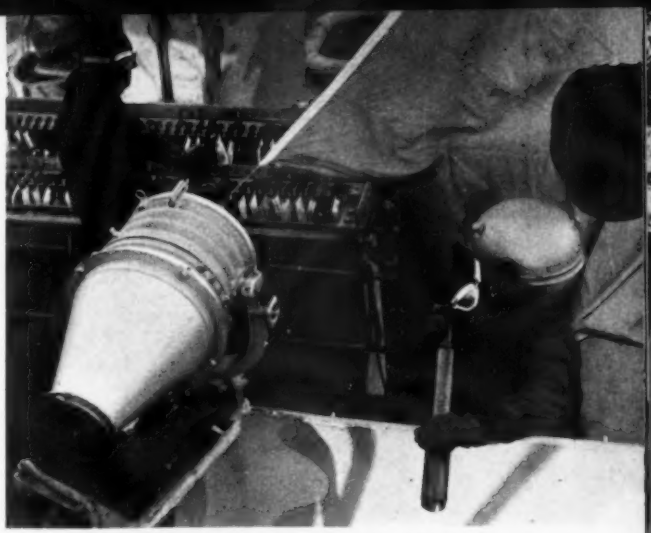
But like all shepherds, these specialized sea-dogs, the convoyers, keep their sharpest eyes out for possible marauders—sky, surface, or submarine. What the lookouts perceive or suspect is transmitted by the signalmen at once for confirmation or denial by lookouts on ships nearer the object sighted.

(Top) Full steam ahead, all flags flying! Flags, wigwag, and light-flasher are three of the signalmen's tools. *(Circle)* Boo! But the Mars-man garb is sensible, not theatrical, protection against the North Atlantic's sun, wind, and cold. *(Right)* Certain flags go up on entering every strange port.

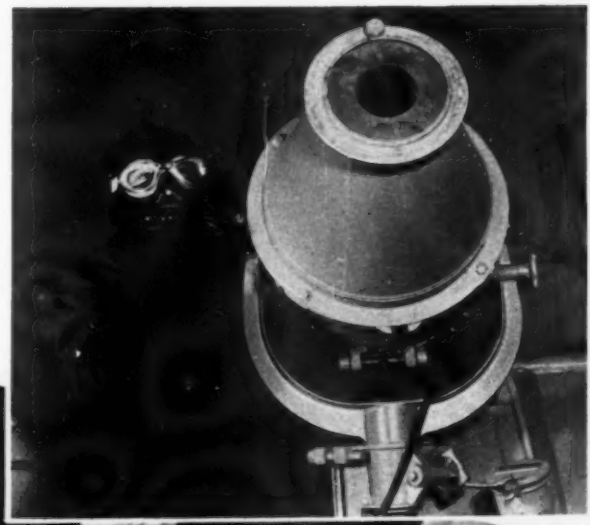
If it's an enemy, bells clang aboard the men-of-war, commands are barked into the ship's intercommunication systems, and as warships wheel into attack, the men on the signal bridges are furiously, vitally busy flashing and flagging orders and information among the guardians and guarded of the convoy.

Radio communication, you think, would be much easier and simpler. Right, but broadcasting by convoy members would be heard by enemy ears over the horizon as well as nearer. Convoys want to attract no attention. A premium consequently is placed on silent intercommunication. Hence the dependence on the skill of the men behind the light-flashers, sun signal machines, flags, and telescopes.

The splendid work of these men on North Atlantic duty is evident in the fact that of 2,000 cargo ships carrying food, war materials, and troops to Great Britain since January 1, only eight have been lost!

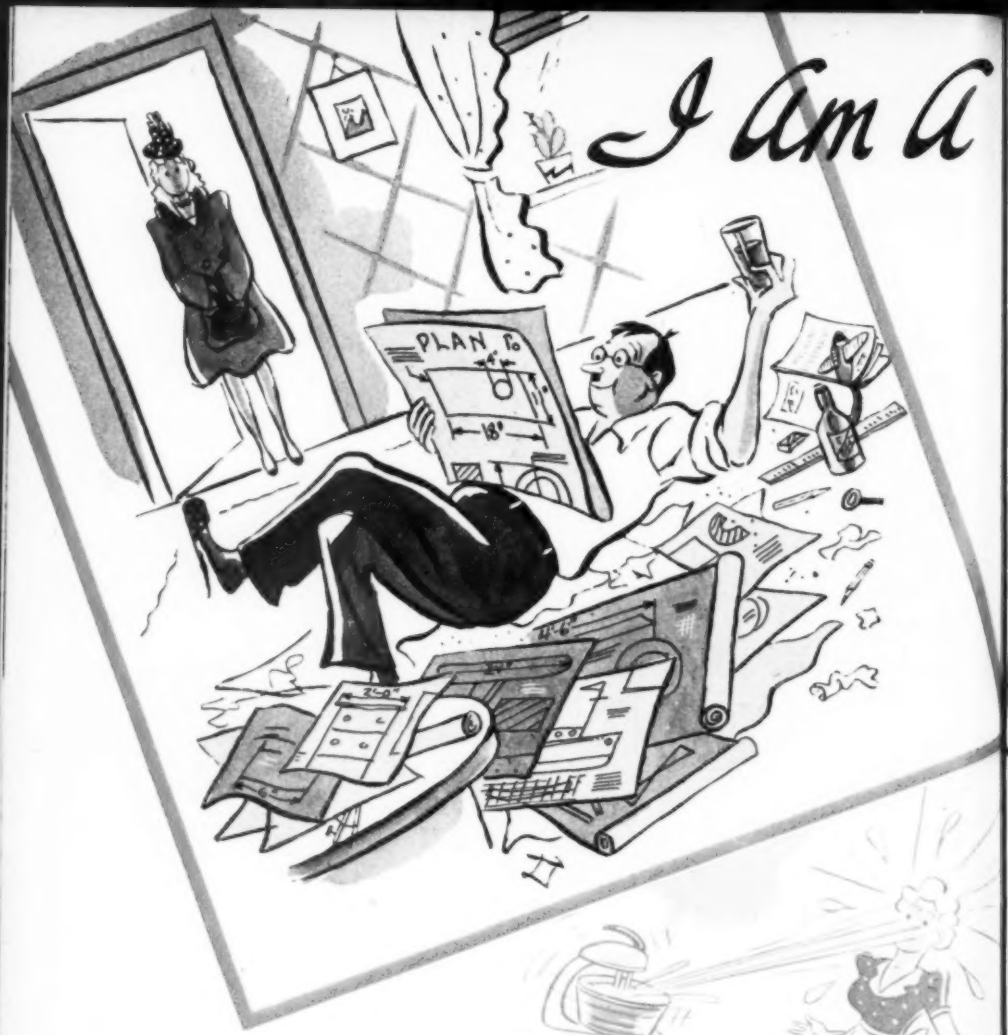


With a telescope an order is read off for communication by flags.



(Right) The sun signal machine dit-da-dits Morse code according to flicks of the operator's mitted hand. *(Below)* The signal patrol's storm-booted "black phantoms" selecting letters and numerals from the flag chest.

I am a



Male MI readers won't understand this lament. A workbench has come between this gal and her spouse!

by Ara Elizabeth Burton

I AM a home workshop widow. My husband has a shop in the garage, basement, kitchen, and sometimes in the living room. My house is cluttered with gadgets most of which don't work. When company rings my door bell I never know whether they'll have their picture taken automatically, or be electrocuted.

My husband runs heavy motors, machinery, arc welders, and assorted test lines, all form the house wiring. He has an extension line from the back porch to the garage. At night when the house lights go dim, I rush to the back porch and put a pan under

a Workshop Widow

"A half hour after hubby said 'this'll take only a minute' I happened to glance toward the kitchen—"

(Below) Typical workshopper's living-room. This is photo of an MI editor.

the wire, to catch the insulation that melts off.

I lay awake nights, thinking up lies to tell the man from the light company when he comes to ask if we are running heavy motors from our light line, because some one overloaded the transformer on the pole, and it's burned out.

Our car, which is loaded with all sorts of trick switches, air conditioner, heater, radio, and a little devil that thumbs his nose at you, as you pass, has never been in the garage. It sits on the street, while friend husband sits in the garage surrounded by lathes, drill presses, grinders, gears, soldering irons, brass, iron, tin, glue pots, paint cans, blue prints, models, finished and under construction. The shelves are lined with my fruit jars which now contain, not fruit, but nuts, bolts, screws, washers, old clock parts, and scavanged junk of all descriptions. [*Continued on page* 148]

ROCKETS IN THIS WAR

Already speeding tropedoes and launching planes, rockets are ready for more use!

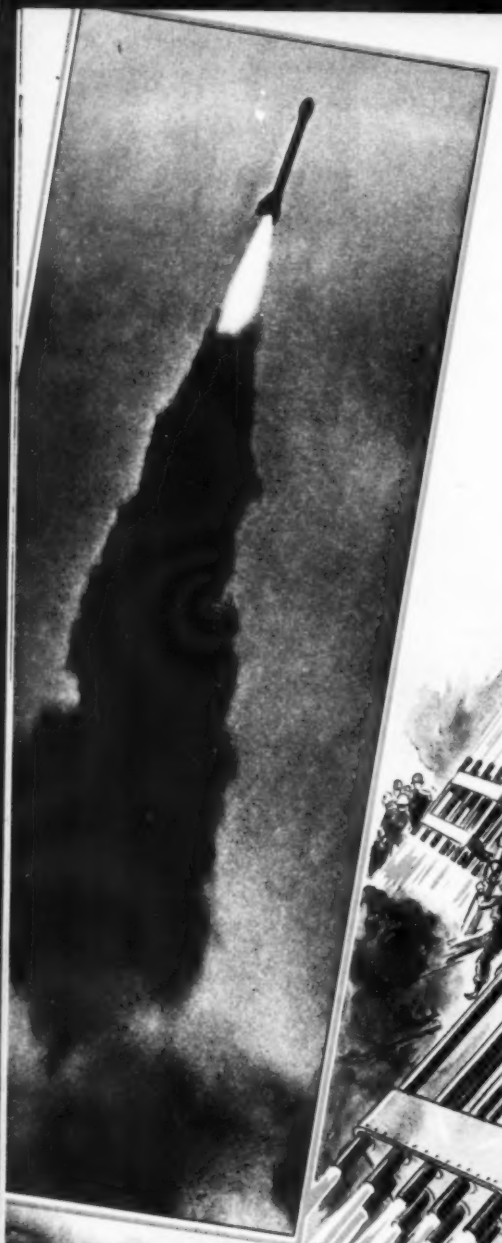


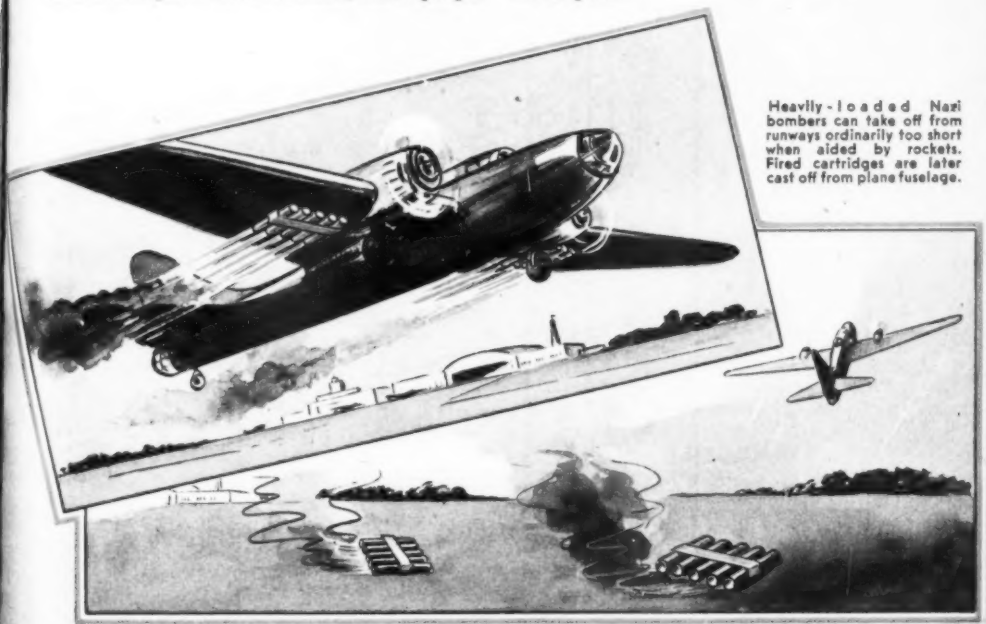
Photo above shows shell fired from a rocket gun. Artist's sketch depicts Russian rocket-bomb battery.

Mechanix Illustrated Drawing By Reynold C. Anderson

by Willy Ley

Secretary, European Rocket Society

FOR many years it has been one of the standard predictions of numerous writers that rockets would play an important role in the "next war." And when that war came and Hitler made his much-discussed but in all probability non-factual reference to the "secret weapon" of his armies, most people took the advent of the war rocket for granted. It was customarily believed to be a kind of super artillery with unlimited range and many people even argued that Hitler would not have started his war of attempted world conquest if he did not have such a weapon at his disposal.



Heavily-loaded Nazi bombers can take off from runways ordinarily too short when aided by rockets. Fired cartridges are later cast off from plane fuselage.

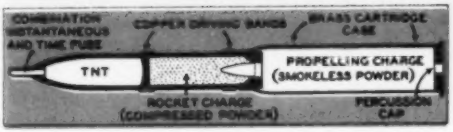
Wheeling for the take-off on the northwestern front *(top)*, Russia's Shturmovik planes are equipped with rocket-accelerated bombs, which have been especially effective against German tanks. Photo above shows tanks blazing from such attack.

Actually rockets began to appear only recently in the present war and not in any one of the forms that had been predicted. They did not appear as super long range artillery; they were not fired from the ground against hostile aircraft in the form of "gigantic air torpedoes with wireless control." Airplanes did not launch rocket torpedoes against each other and it is doubtful whether rockets were used as auxiliary power plants for fighter airplanes although there exists a considerable amount of technical literature on just this possible application.

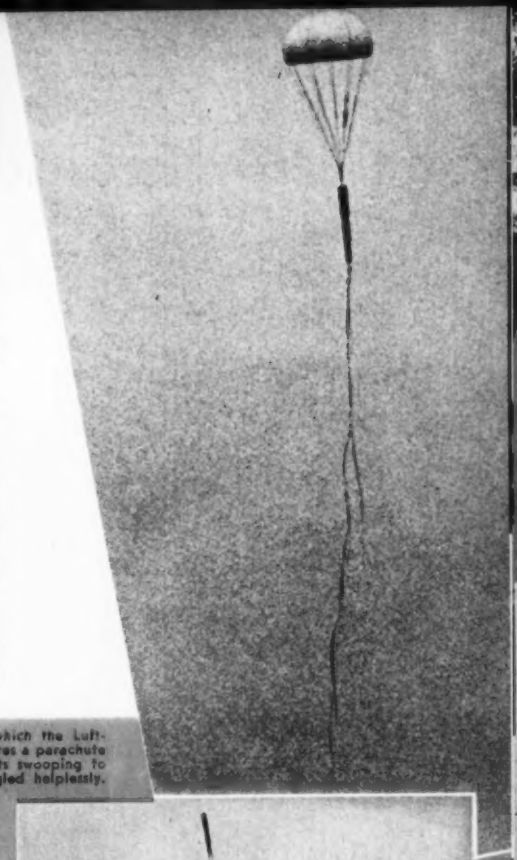
But they did appear as auxiliary power plants for the take-off of overloaded bombers and they are used, according to a recent British news release, as anti-aircraft weapons. And they have found a very important application in special airplane bombs.

But before these various applications can be discussed it is necessary to get a few facts about rockets and rocket power straight. Two main types of rockets exist, called liquid-fuel rockets and solid-fuel rockets. In the former case the fuel is alcohol, gasoline, or a liquefied gas like methane in conjunction with liquid oxygen. In the latter case the fuel consists almost invariably of a mixture similar in composition to old-fashioned black gunpowder. In fact the ingredients are the same, saltpeter, sulphur and charcoal. Only the proportions differ.

In either case the fuel is burned rapidly so as to generate large quantities of combustion gases which are ejected through a nozzle and cause the rocket to move by reaction against the jet of gases. The faster the jet, the more powerful the reaction. Liquid fuel rockets possess quite a number of theoretical and actual advantages as compared with powder rockets. Their fuels are not dangerous, being kept in separate tanks, the flow of the fuels can be regulated by means of valves, the proportion can be changed and the burning time prolonged and last but by no means least, liquid fuels show higher exhaust velocities, a faster jet. But they have the disadvantage that they cannot be stored when charged (at



Cross-section diagram *above* shows proportionate content of the 20 mm. rocket-shell which is fired by Russian attack-planes.

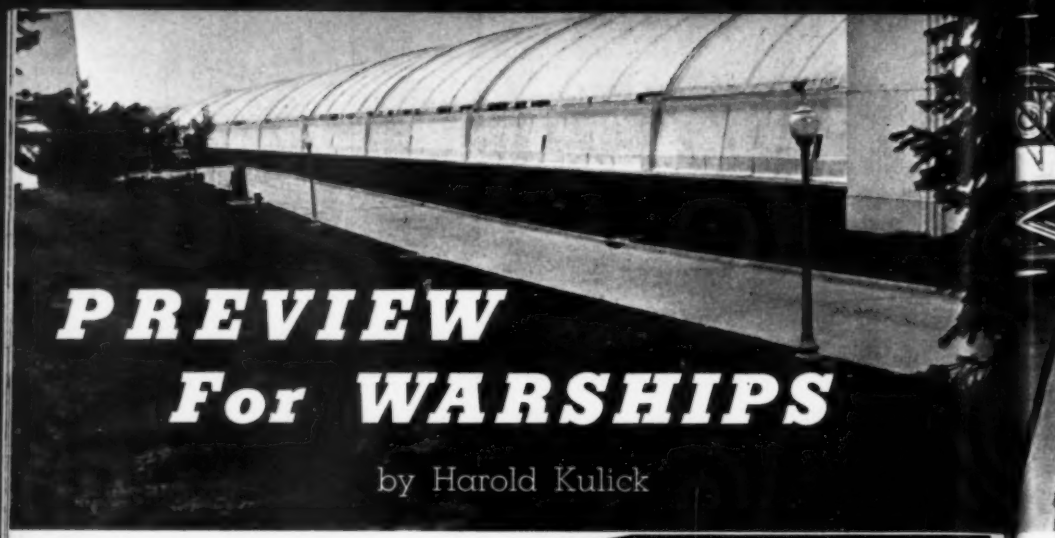


least not yet) and for military purposes powder rockets have been preferred because of the simplification of storage.

All the applications of rocket power in the present war refer, therefore, to powder rockets.

The first to use rocket power during the present war were the bombers of the *Luftwaffe* in their unsuccessful assault on Great Britain in general and London in particular. Working with improvised field airdromes in conquered Holland and Belgium they found that they had considerable difficulty getting their overloaded bombers off the short and presumably not too excellent runways. They then devised a kind of framework which was fastened to the bottom of the fuselage of the bomber. A number [*Continued on page* 163]

These photos show the British Merchant Navy's rocket gun which the Luftwaffe fears. *(Below)* Sailors connect wires to the rocket which fires a parachute *(right below)* with long wires attached *(right)*. Aircraft pilots swooping to attack ships must swerve or the plane props become entangled helplessly.



PREVIEW For WARSHIPS

by Harold Kulick

This quarter-mile-long building contains three model-testing tanks. Models are meticulously shaped from laminated pine, finished, set away *(below)* till test time. *(Right)*: These dynamometers will record a self-propelled model's actions. Data are filmed, too.

U. S. NAVY officials get an accurate preview of how new vessels—PT boats to cruisers—will perform when they view tests of models of them at the government's David Taylor Model Basin at Carderock, Md. Experiments with scale models have saved the government and ship builders millions of dollars since they were begun in 1899.

A deep basin tests large hulls with models 20 ft. long; a high-speed basin is for 8 to 10 ft. models of mosquito boats and seaplane hulls; and a shallow basin tests all types' maneuverability.

Models are towed through the deep basin by carriages specially built so that tests don't vary. *(Right)*: Observers on suspended platforms record performance as shown by instruments in the hull. *(Below)*: Stroboscopic light aids accurate observation of propeller action in water-tunnel test.

FIGHTER COMMAND

P-38 "Lightnings" are constantly kept serviced in case of alert. They climb to 35,000 feet swiftly.

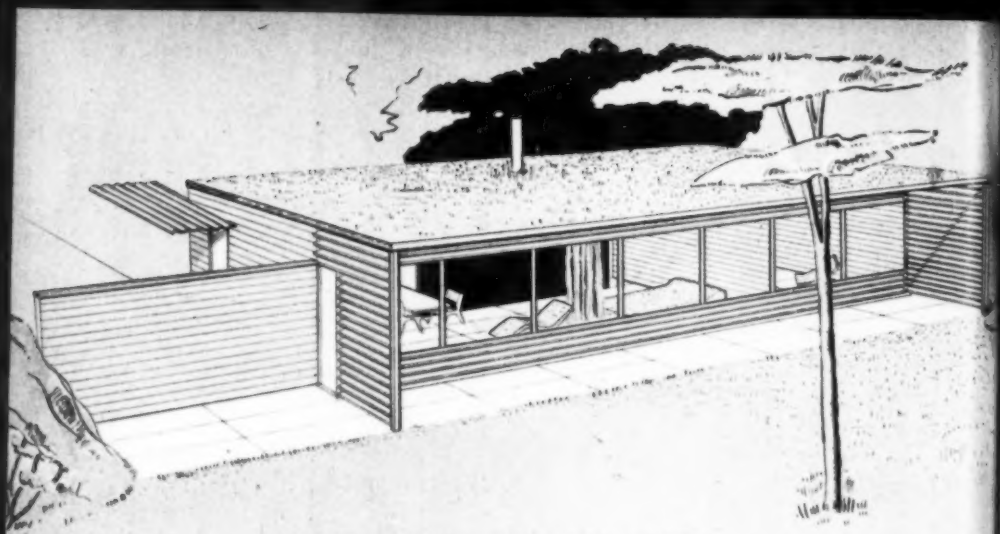
First photos ever released showing the manner in which P-38's are loaded. Canister slides out to take shells.

Pilots kill the long hours of waiting between alarms by playing cards and other games in the squad room, above.

THESE are the boys protecting the coasts of America against bombing attacks—on duty 24 hours a day, seven days a week to guard America's skies. It's a monotonous life, alternating between long hours of waiting in the squad room and thrilling speed flights to check on unidentified planes. These photos were taken at Mitchel Field.

But when the "alert" sounds, they run for action stations.

The pilot finds his plane warmed up, ready for a thrilling take-off.



Typical of revolutionary new home designs now being developed is this house designed by George Keck. It has all-glass south wall and sod roof for insulation.

YOUR NEW PEACETIME HOME

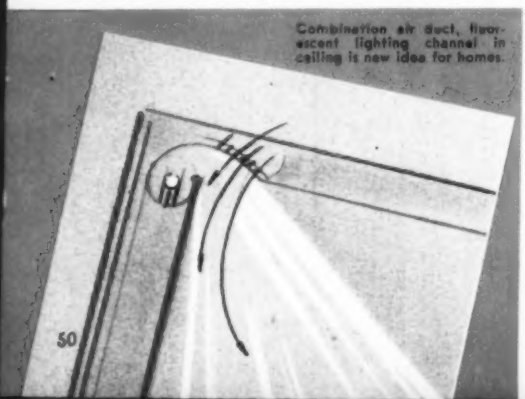
You will probably rent your lot instead of owning it in the future, for your coming home, after the war, will be a marvelous machine—as mobile as a trailer!

by Donald G. Cooley

Designs by Martial & Scull

Second in the MI Series
"A WORLD YOU NEVER KNEW"

WITHOUT a roof over your head, you sit with your family in the middle of a vacant lot and wonder what has happened to your new house that the factory promised to deliver first thing in the morning.



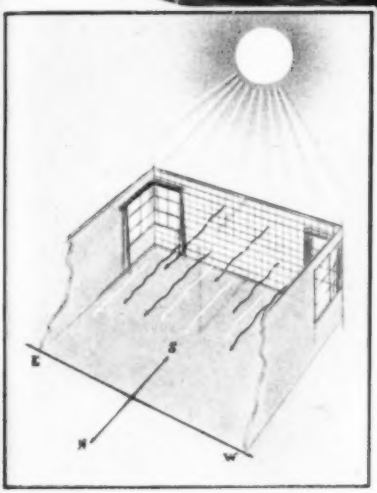
Combination air duct, fluorescent lighting channel in ceiling is new idea for homes.

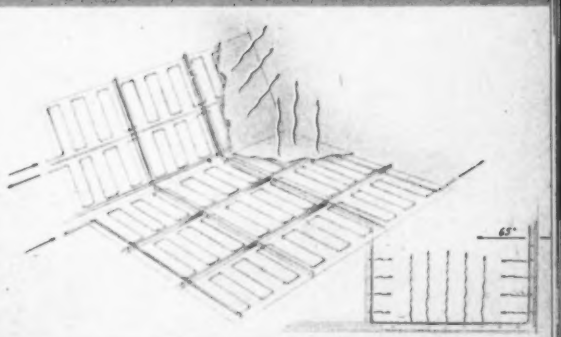
There you are, with a two-year lease on the lot and no house in sight. You don't want to rent the lot for a longer period, for your company will transfer you before long and of course you will want to disassemble your house and take it with you.

But wait—here comes a moving van, pulling right up beside you. Workmen swarm out of a couple of automobiles, open the van doors and start pulling out your house, section by section. Precast concrete piers are set in place for the foundation, and while a pair of workmen install the heating plant, others lay the floor panels.

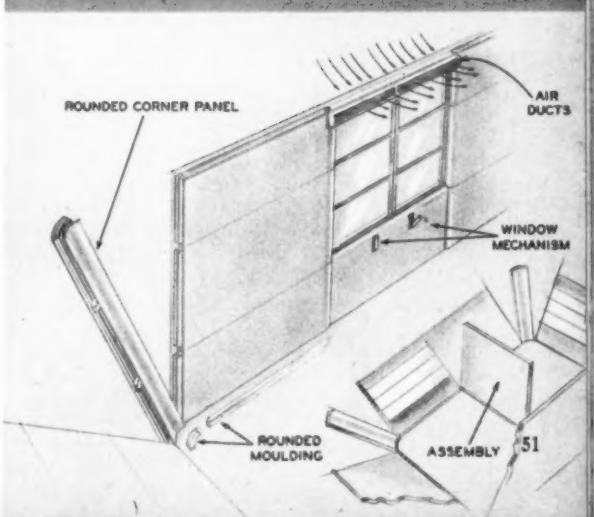
Like a fast-action movie, wall panels go up and partitions spring into place at a pace that

Though this house looks like conventional home, it is completely prefabricated! Made by Gunnison.





Upper left: Large use of glass blocks in south wall uses sun's heat in winter. *Above:* Radiant heating installation is diagrammed. Pipes in floor and wall radiate heat in winter, absorb it in summer. See story. *Below:* Martiel & Scull design of prefabricated sectional construction. Note dust-free rounded corner panel and moulding.



makes your head swim. You smile—but smugly—as you think about insulators, plumbers, painters and electricians. You have bought and paid for their services, all right, but their skills are built right into the house package. Those prefabricated panels contain not only doors and windows, perfectly hung, but electric cables, plumbing pipes, heating lines and insulation. Glass-hard surface finishes prove that during the lifetime of your house, your only need for a painter will be to produce portraits of its occupants.

Long before noon the roof panels are ready to go in place, so you telephone the warehouse to rush your furniture over. When the five o'clock whistles blow you are lounging in your living room, listening to the radio and sipping a drink cooled by ice cubes from your refrigerator, while junior takes a hot

Watch a new miracle home go up! Built in complete, self-contained sections, with the plumbing already installed, it can be assembled in about six hours on your lot. *Left*, rollers under each section enable workmen to slide one-third of house off truck onto foundation. *Below*, Heave-ho! and the first section rolls into place. See next page.

shower and your wife prepares dinner in her shiny new kitchen.

A pipedream? Look at the hundreds of houses springing up overnight in defense areas, and you'll be convinced that prefabrication is here to stay. Complete houses have been erected in an hour and a half. Not crackerbox shacks, either, but houses with features any home-owner would envy.

These houses are not necessarily the identical models you will have after the war. Some are better than others. "Bugs" are being ironed out, scores of new materials tested. But the day of the old-fashioned hand-built house is gone beyond recall, except perhaps for the wealthy who can indulge their fancies. No longer is the prefabricated house a vague post-war possibility; it's a certainty. After years of bewailing the wastefulness and inefficiency of old-line construction methods, the war has at last forced mass-production methods and first-rate engineering upon the industry, giving it the biggest shot in the arm it has had since the first caveman scooped a bedroom out of the side of a cliff.

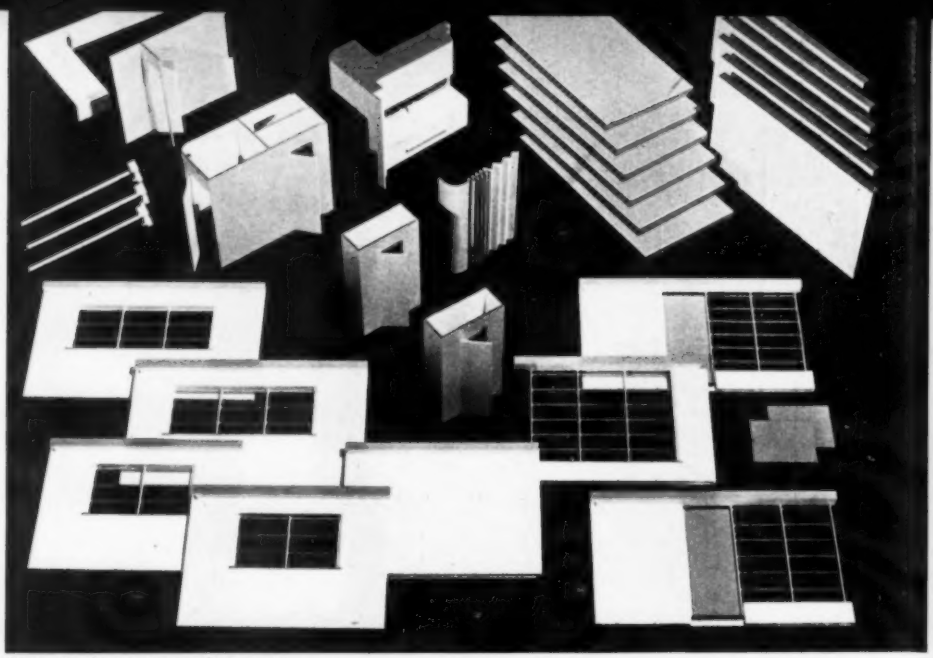
More than 150,000 prefabricated *and demountable* defense housing units have already been ordered. Some 50 companies are making them. Right now there is an estimated shortage of 2,500,000 homes in the U. S., increasing at the rate of 500,000 a year. That

Above: Here you can see how the sections slide together, like a jig-saw puzzle. The third section has been rolled off truck at *right*, down slide, onto foundation. Tie-rods secure the pieces. It can be moved to a new lot as easily.

Above: See how the plumbing comes already installed! *Below:* The minute the pieces are assembled, the housewife steps into a real home.

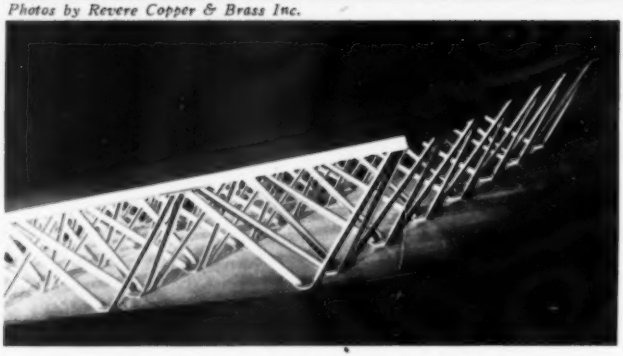
gives you an idea of the tremendous post-war market—of all the changes to come, probably the new housing will affect the most people in their everyday lives.

If costly, old-fashioned building methods could have satisfied the market, the present shortage would not be so acute. The new houses must not only be good—they must be inexpensive. By eliminating the sawing and fitting of hundreds of small pieces of lumber at the site—no driving of nails, no messy plastering and

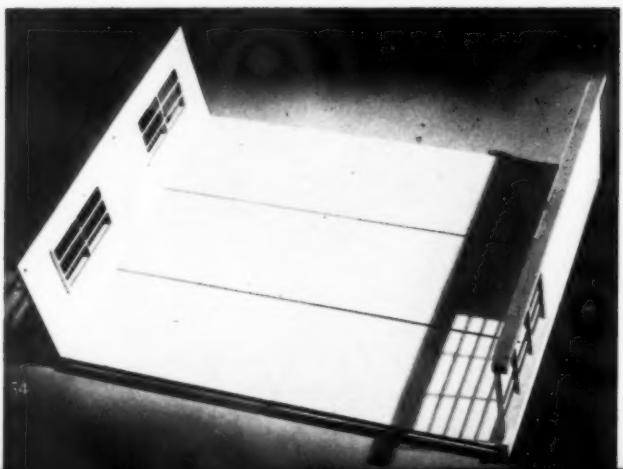


Photos by Revere Copper & Brass Inc.

Believe it or not, the photo above is of a complete house! It is of a model designed by Norman Bel Geddes for post-war manufacture. See *below*.



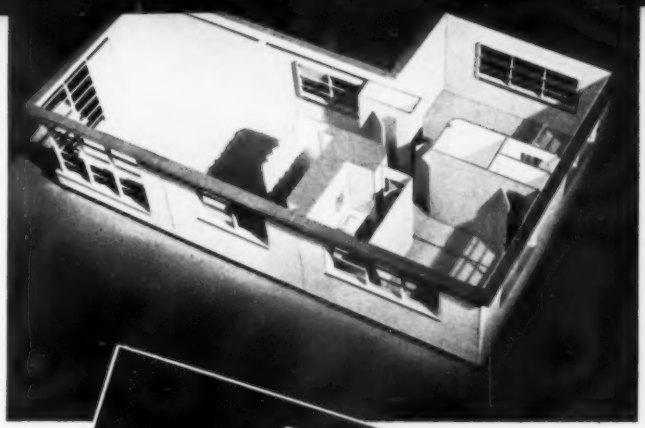
Starting with 27 basic units shown at *top* of page, Norman Bel Geddes' house is assembled this way: *Above:* Floor and wall panels have trusses made from core of expanded sheet metal, giving strength. First step in assembling floor and walls *below*.



fitting of pipes—manufactures aim toward a top price of $2,500 (some set it at $1,700) for a 4½-room, fully equipped, insulated house after the war.

Who'll make these houses? All you can be sure of is that the building industry will face competition from new quarters, just as auto makers will find airplane companies turning out cars after the war (see MECHANIX ILLUSTRATED, October, 1942). For that matter, at least one auto manufacturer plans to bring out a house-in-a-package after the war. Already the motor companies are in the household equipment field: General Motors makes Frigidaires, Nash produces Kelvinator products, Chrysler manufacturers Air-Temp air-conditioning units. Norman Bel Geddes, noted industrial designer, says "It is my belief that manufacturers

The 27 basic units shown on *opposite* page can be assembled in many different ways, to give homes variety. Two photos at *right* show two floor layouts possible with Geddes units.



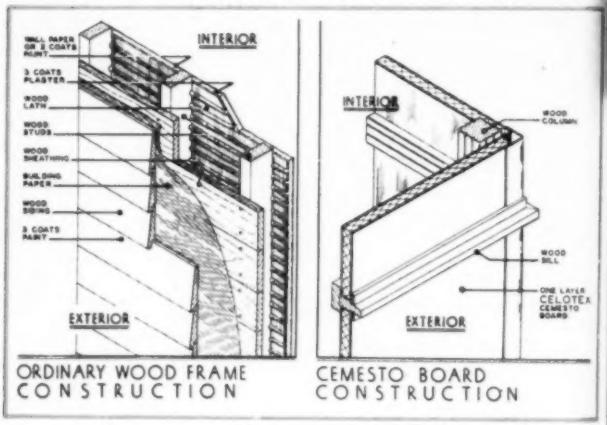
in other fields, such as the aviation or shipbuilding industry, are in a good position to reap the benefits to be derived from prefabricated housing."

Your peacetime house may be made of sawdust and cotton, of wood pulp and resins, of plywood and plastics, glass and concrete and magnesium and aluminum and stainless steel—of dozens of new materials that the war has showed manufacturers how to use.

You can shake a prefabricated house in a hurricane, slash it with an axe, drown it in a river, apply a blowtorch, boil it or steam it, and it comes up smiling. Walls don't crack, the house doesn't sag, since all panels are completely insulated and do not expand

Below are exteriors of three widely different homes —all built from identical Geddes units. Note how the "curse" of prefabrication uniformity is avoided.

Now watch another type of house go up in one day. *Above:* Oil furnace is installed. *Below:* Cemesto wall slabs go on. Slabs hang from frame like curtain. Construction details at *right*.



Right: In no time at all, workmen slap up a side of Cemesto house. Skeleton for house is prefabricated. Windows fit snugly into slabs. Note horizontal construction. Whole house goes up in less than a day. See *opposite*.

or contract with temperature changes. Moisture doesn't affect them. Mice, termites and vermin go elsewhere to set up housekeeping. Most such houses never need interior painting, and many of them use no outside paint either.

Your house, going up in a day, comes down just as fast. The government insists that defense houses be demountable. They can be set up somewhere else if industrial conditions change. Unfasten a few bolts, pile your house panels into a truck or freight car, and it accompanies you to your new homesite. No housing shortage for you when you carry your roof like a turtle!

We don't yet dream of the sociological changes that house demountability will bring about. Grafting politicians who saddle out-

Here is the complete 4½-room house you saw built on the *opposite* page, put up in one day. Only the trim needs paint.

rageous taxes upon communities will wake up some fine morning to find that their voters have folded their houses like the Arabs and silently stolen away. The paralyzing possibility of an exodus of taxpayers should be enough to insure municipal efficiency.

You will, of course, prefer to rent your house-lot rather than buy it. You'll be glad to pay higher land rent (because of higher taxes) to be within the area of a good school system while your children are young. In later years you may prefer to take your house to the country where land rents cheaply and you no longer need good schools.

The trend toward renting land is already here. You see it working out in trailer camps which have sprung up in defense regions. And for years the land on which business structures are erected has been customarily rented on long-term leases, rather than bought.

Let's get back of the scenes and inspect some typical prefabricated houses. You might call them test-tube houses, for they are demonstrating the products and principles that will be incorporated in your peacetime house. You'll find there are so many different styles that the bogey of "mechanical uniformity" just doesn't exist. Prefabricated houses can be just as individual as any row of Spanish bungalows or "olde Englysshe halffe-tymbered" houses—and in better taste for America. Remember that the houses we are describing are thoroughly engineered, many of them are already built in quantity, and all of them would be available to you right now were it not for the war.

Step into the house of tomorrow designed by Norman Bel Geddes. Light streams into the living room through windows that stretch from floor to ceiling. The 24-foot living room has a warm wood finish and one end can be closed off into a dining room by pulling out a disappearing "wall" [*Continued on page* 149]

THE COMING MARVELS IN HOUSEHOLD MACHINERY

In this article, you have seen a "sneak preview" of the wonderful, new house you will be buying after the war. But what of the kitchen range, the lighting system, refrigerator and all your other household appliances? Did you know that tremendous new advances made as a result of wartime research have already made your gas range obsolete? That your present lighting system is as out-dated as kerosene lamps? Do you know about the new dust-eliminators? Have you any idea what plastics will do to your kitchen? Be sure to read the next in MI's series, "A World You Never Knew," in the December issue. It will show you the wonders of "Your Coming Peacetime Household Machinery."

WHAT TO DO ABOUT

1 IF YOU SAVED YOUR LAST WINTER'S ANTI-FREEZE...

Some of the ingredients of "Prestone" anti-freeze will last from one winter through the next—those, for example, which protect the car against freeze-up. But to give protection against freeze-up is only one function of a good anti-freeze. A good anti-freeze also performs other functions, just as important. One of these is to guard against rust and corrosion . . . which is why all good anti-freezes are "inhibited." These inhibitors do wear out; and when that happens the car is no longer protected against clogging and overheating caused by rust.

That is one of the reasons why you cannot use an anti-freeze indefinitely . . . why, for instance, we guarantee "Prestone" anti-freeze for "a full winter's use," and no more. *New, fresh anti-freeze is always to be preferred over anti-freeze which has gone beyond a single winter's driving.*

If, however, you decide to re-use your anti-freeze, take the following precautions:

If you stored your anti-freeze during the summer, take it to your dealer *before* putting it back in the car. There are 2 good reasons.

A *To make sure that no dirt or foreign matter has spoiled it.* (Cans frequently rust through from the outside and from the bottom. Dirt and foreign matter will clog your cooling system badly.) If your solution is brown or rusty-looking, don't bother to take it to your dealer but discard it at once. Be extremely cautious in this regard. Your car is a valuable property: it is in the interest of sound conservation to take all reasonable precautions.

B *To have the strength checked* . . . You don't know, definitely, what concentration you had at the end of the season. If your anti-freeze was "alcohol base," you almost certainly lost strength before you took it out last spring. Even if you used "Prestone" anti-freeze, which contains no boil-away alcohol, have the strength checked just the same. You may have lost protection through careless filling, slop-over at the over-flow pipe, and leaks caused by road-shock and wear-and-tear during driving.

if you left your anti-freeze in your car, and have been driving with it all through the summer, point B (above) is even more important, for obvious reasons.

These precautions are the very least you can take to protect your car. Remember, none of them will put back into the anti-freeze the rust and corrosion inhibitors which were there when you bought it last fall, and which have since been used up. This is one of the sound technical reasons why manufacturers guarantee anti-freeze for only one winter's driving.

ANTI-FREEZE THIS FALL

2 IF YOU DID NOT SAVE YOUR LAST WINTER'S ANTI-FREEZE...

See your dealer at once and get "Prestone" anti-freeze installed in your car. As of the date this advertisement goes to press (approximately July 15th) it appears that there will be enough "Prestone" anti-freeze this fall—after Army, Navy and lend-lease requirements have been met—to supply all regular users. We make this prediction because we have increased our manufacturing facilities and because there will be fewer cars on the road this coming winter.

HAVE YOUR DEALER CHECK YOUR CAR for leaks, rust, sediment, or loose connections which may have developed during summer driving. Make sure your "Prestone" anti-freeze is used in a clean, tight cooling system. Then you can *forget* the anti-freeze problem for the rest of the winter. You will be protected completely—against freeze-up, boil-away, dangerous and obnoxious fumes, rust and corrosion. You can place complete confidence in new, fresh, full-strength "Prestone" anti-freeze. It is *guaranteed* for one full winter season.

Product of NATIONAL CARBON COMPANY, INC.
Unit of Union Carbide and Carbon Corporation

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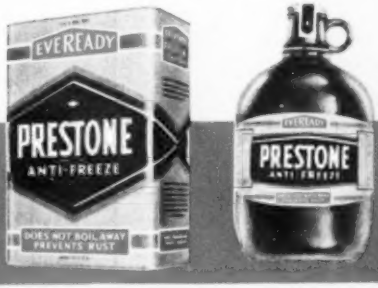


PRESTONE
TRADE-MARK
ANTI-FREEZE

YOU'RE SAFE AND YOU KNOW IT
...ONE SHOT LASTS ALL WINTER!

IT'S THE SAME "PRESTONE" ANTI-FREEZE, no matter which container it comes in—metal can or glass jug. To conserve metals for wartime use, the familiar "Prestone" anti-freeze can was discontinued early this season, and the sturdy new glass jug was substituted. Your dealer may have cans or jugs or both. Buy either. No difference in the "Prestone" anti-freeze they contain.

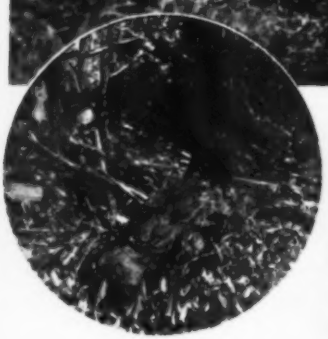
New U. S. Crop: Briar Burls

War cuts off European briar, and harvesting domestic burls becomes profitable.

by Bertram Brownold

BECAUSE of the war many an obscure man in French Algeria, Greece, and Italy has found the markets closed for the burls he laboriously but cheaply cut for American pipe-makers from large bushes of the heath family growing in his country. Not that the pipe manufacturers want the burls no longer, but that shipping space formerly occupied by the 30 million blocks annually imported is now reduced greatly or is required for more vital goods than the material for consoling, but nevertheless luxurious, pipes.

As a result, men in obscure parts of the southern Appalachian mountains and of manzanita-growing sections of Mexico and western United States are profitably busy in harvesting an unexpected new crop. Burls on the roots of mountain laurel and



Top: In California tractors are now tugging manzanita burls out of the ground for tobacco pipes. *Circle:* Bulbous growth at the base of a mountain laurel stem is typical burl found in the southern Appalachians. *Right:* About 1½ tons (value: about $17) of burls sledded out en route to mills. (*Lower photos from U. S. Forest Service*)

rhododendron that grow in huge thickets in the Appalachians, and on some manzanita shrubs, have been termed suitable for pipes. Previously, cheap European labor made the gathering of domestic burls (which are admittedly below the quality of imported briar, anyway) unprofitable.

Nowadays, many tractor crews like that of Robert Blohm of Watsonville, Calif., can tug out 20 tons of bulbous manzanita roots in an eight-hour day which previously yielded only five tons. Production, rapidly expanding, is now about one-fourth of the U. S. requirements.

At the mills, $10 to $12 a ton is paid. Many mountain farmers have taken advantage of this market for a product heretofore valueless to them, and the money has been a real help to the living standards of people of regions where annual cash incomes are meager.

The burls' sizes range from that of a hen's egg to giants as big as a barrel. But none smaller than a man's head can be used successfully in making pipes. Such a head-size burl is usually about 40 years old and weighs about 25 pounds, while giants are 200-300 years old and weigh around 250 pounds.

The burl is remarkably tough, hard wood. Its fire-resisting properties and beautiful color and grain make it the most popular wood for tobacco pipes. The supply of good pipe burls, wherever found, will be exhausted in time, for they are being used up more rapidly than they grow.

Gathering burls in the Appalachians is far from being in the category of a pleasant berry-picking excursion! Finding the burls in itself presents difficulties. Even the small portion that grows above ground is usually hidden under fallen leaves, moss, twigs, and forest litter.

In the tussle of extracting the burl, the main stem of the bush is first cut off about two feet up. Then the earth around the burl is loosened with a pick. Finally the burl is pulled up by means of block and tackle, its roots being severed one by one with a keen ax as they are pulled into view.

The burls are taken through the trackless wilderness to a plant where they are dried, seasoned, and cut. Drying and seasoning take from six months to two years depending on the burl's size and moistness. A sappy burl cannot be properly worked and makes a poor pipe.

When thoroughly dry the burl is cut into blocks suitable for pipe making. A large part of the burl, chiefly the center, must be discarded, however. The blocks are cut at the source and shipped to the factory in bags to avoid transporting waste wood. At the factory, the blocks are graded and sorted for size and blemishes. Those slightly blemished are used in cheap pipes. Badly blemished blocks are discarded.

Suitable blocks are squared, the bowl shaped, tobacco-chamber cut, air-passage drilled, the shank ferruled to accommodate the bit, and the surface sanded, stained, and polished. At last it's snapped on a display board and offered for sale at your corner tobacco shop!

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So You Want To Find A

"La Sombrera" at the head of Needle Canyon appears just as Pedro Peralta saw it when, in 1846, he discovered fabulous bonanzas nearby. *Left to right*, arrows indicate charcoal pit in which miner's drills were resharpened; Dutchman's camp identified by rifle shells (first inset) and other relics, boulder in Needle Canyon under which the Dutchman hid his partner's equipment—coffee grinder, square iron nails (second inset), fry pans, etc.; first Peralta mine to be found, the key marker (third inset) from which was mapped the black-topped mountain to the west and La Sombrera to the south, east slope of mapped mountain where a mysterious killer's bullet cut Adolph Ruth's search short in 1931 just when he had struck a hot trail. The fourth inset shows one of Spanish miner's signs from top of the same mountain which indicates: "Mines are nearby!"

In February we gave you the key to the Lost Dutchman Gold Mine. Here are keys to eight more such bonanzas!

by Barry Storm

THE mining profession calls me an Exploration Engineer. But I am a treasure hunter specializing in *antigua* mines as the Spanish call their ancient, long-forgotten workings. I make a business of finding "lost" mines, and I expect to continue finding them as long as one exists with a clue to its location.

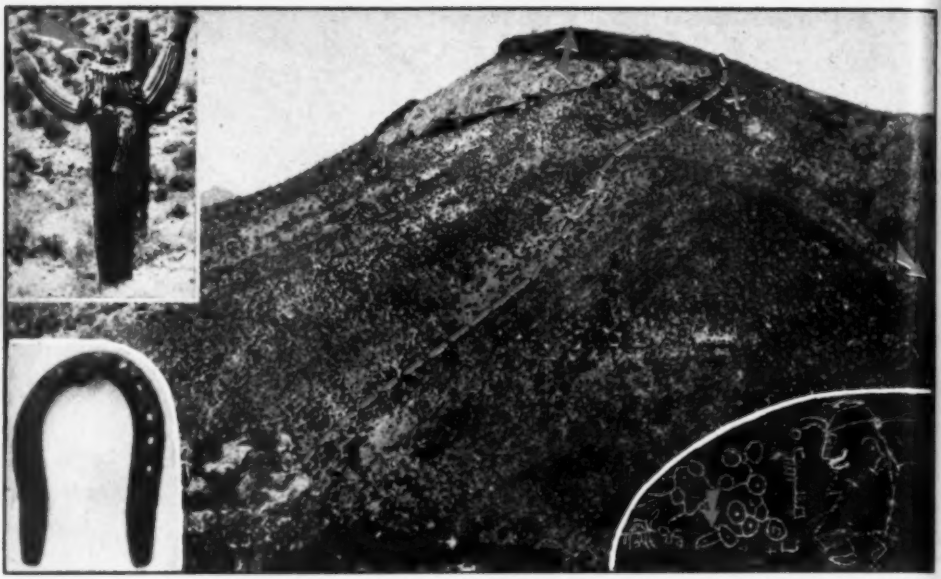
I "discovered" the first such mine in the Superstition Mountains in spite of blood curses, Apache thunder gods, and ambushers' bullets. And the news stories are hardly cold on my recent finding of the Lost Tonto Trail Copper lode in the same region. Recently, too, I have come upon "float" actually assaying $1,002 gold—fragments of fabulously rich ore—which I expect to backtrack to another of the legendary bonanzas.

On the strength of these unusual qualifications then, I state a little known but startling fact: that besides the famed Lost Dutchman, which was originally one of a Spanish group of workings, there are really seven more lost mines nearby. And almost all of them, according to occasional ore brought out of the Superstitions through the years by chance finders, are of equal richness!

d A Gold Mine?

(Above) The author's master map of the Superstitions, showing locations of principal clues discovered to date. Goldfield, *left*, now a ghost camp on the Apache Trail highway, was once a million dollar mining town. Near it the turn-off road indicated by dotted line is passable to First Water Ranch shown by circle. Numbers locate: 1—Gold ore; 2—Spanish trail sign; 3—Military trail remnants; 4—Gold ore on Peralta-mapped mountain; 5—Spanish muleshoe; 6—Spanish miner's signs; 7—Ruth murder site; 8—Wiser's equipment cache; 9—Probable site of Dutchman's cave; 10—Peralta key marker from which map was made; 11—Approximate site of ex-soldier's rich vein; 12—Cedar logs marked by mining use; 13—Dutchman's stone face and Apache horse's head markers; 14—Area in which a cattleman found gold ore; 15—Permanent water near Spanish campsite; 16—"Map rock" pictograph; 17—Spanish charcoal pit; 18—Dutchman's campsite; 19—Rediscovered Spanish mine; 20—Spanish camp ruins; 21—Start of Wiser's trail, shown by dotted line. *(Right)* Barry Storm near one of the lost mines.

This may sound fantastic—too good to be true—until you consider an equally alluring fact: The whole history of mining has proven time after time that ore bodies rarely occur



A bird's-eye view of the black-topped mountain from high up across Needle Canyon, *above* the key marker. The top arrow shows site of Spanish miner's signs, the lower the canyon in which Adolph Ruth was shot. The dotted line indicates an ancient trail, still partly marked by Spanish-style topped cactus as shown in *upper* inset. Do crosses from the Peralta map locate hidden mines? In *lower left* inset is a definitely identified Spanish muleshoe found on top. *Lower right* inset shows Apache pictograph. Note Spanish miner with ore sack on back and candles in hat, and mapped accurately. Weaver's Needle (on side), other hills.

alone, particularly those intense concentrations of mineral which form ore of far more than normal richness. And the Spanish miners who first explored the Superstitions were as good prospectors as those whose fabulous discoveries elsewhere made Spain empress of the world. It was inevitable that they had found all the bonanzas which could be located by the prospecting methods of their time. I propose to tell you *about* where they all are and provide tangible clues to their locations—the same kind of clues which have enabled me to maintain a new-mine-every-year discovery record for my own expeditions!

Perhaps, with the job of finding these Arizona treasures half done, your own luck may prove as good!

Legends are usually built around a kernel of truth which often is obscured by time and later complications. This has been the case with mines in the Superstitions. The essential historical fact was the prospecting of the three Peralta brothers, Pedro, Ramon and Manuel. And just as their ancient trails could be followed by the scratch of muleshoe upon rock which leaves for the expert a still-brown streak of oxidizing iron a century later, the treasure hunter follows the theory that no matter where they went or when, they left something behind to prove it—trail markers, campsites, discarded equipment, tools, prospecting work, etc. By thus finding tangible clues to the Peralta explorations, and clues to those who followed them, the region in which they mined generations ago was localized.

The time was in the fall of 1846, in the days when Santa Fe, as capital of a remote frontier province, was the jumping-off place for a vast uncharted wilderness infested by savage Indians—and, the Peralta brothers hoped, gold mines! Miguel, their mining engineer father, had just returned home to Chihuahua City from an *entrada* to the headwaters of the Rio Salado. His instructions had been brief. "Since this river drains that territory," he said, "gold anywhere within its watershed will give traces of itself as placer (erosion-borne particles) in the riverbed. Follow the river, then, until you find such placer gold, and trace it back to its source."

With this method, the three Peralta brothers with their little band of family retainers found their first gold at the present site of Mormon Flat. They did merely a good job of prospecting. In virgin territory the results were as inevitable as they had been for generations up and down the length of the Spanish-held Americas.

Hill at the end of Wiser's trail in Needle Canyon, the only south slope. On it were found (1) the Dutchman's stone face marker, (2) The Apache's horse's head marker actually eight feet high as shown, (3) a Spanish spur-rowel and rope-marked log hoist, and (4) Spanish-style mining crosscuts. The horse's head was the Indian marker to nearby hidden mines. Is it coincidence that it appears so near the stone face often spoken of by the Dutchman? In inset is a Spanish arrow pointing to this region from a south cliff of the Peralta-mapped mountain some distance further down Needle Canyon. It is supposed to point a trail to mines!

But it wasn't mere traces of placer gold that they found. A veritable treasure trove of glittering yellow flakes was there, trapped in the sands of the riverbed. Or enough at least to make both Ramon and Manuel wealthy as they alternately worked, fought off Indians, and at Pedro's direction built the *arrastres* which may still be seen.

In the meantime, Pedro himself backtracked the golden trail to the ore which was to be ground in those *arrastres*. He climbed into the Superstitions on the south, from the river into LaBarge Creek, into Boulder Canyon, on up Needle Canyon into the very heart of the Apache thunder-gods' own sacred mountains! Then at last upon the slopes of a black-topped hill north of a towering, hat-shaped peak, he found first one and then three more outcrops of fabulous golden ore. Four bonanzas in the raw!

Exciting weeks fled swiftly while Pedro and his men turned miners. Finally the packtrain which they had brought from the river was loaded to capacity with glittering rock ready to be ground. Pedro, after the fashion of Spanish miners in strange country, went down into Needle Canyon into which the east slopes of the black-topped mountain drained, and made a key marker by driving stones into a huge *saguaro* cacti. From this marker he mapped the outlines of both the fabulous mountain to the west and the hat-shaped peak "La Sombrera" to the south so that he could be sure of finding his way back to the proper region by merely returning to the point where both matched the map from entirely different directions. Then he returned to the river to find his brothers impatiently awaiting him.

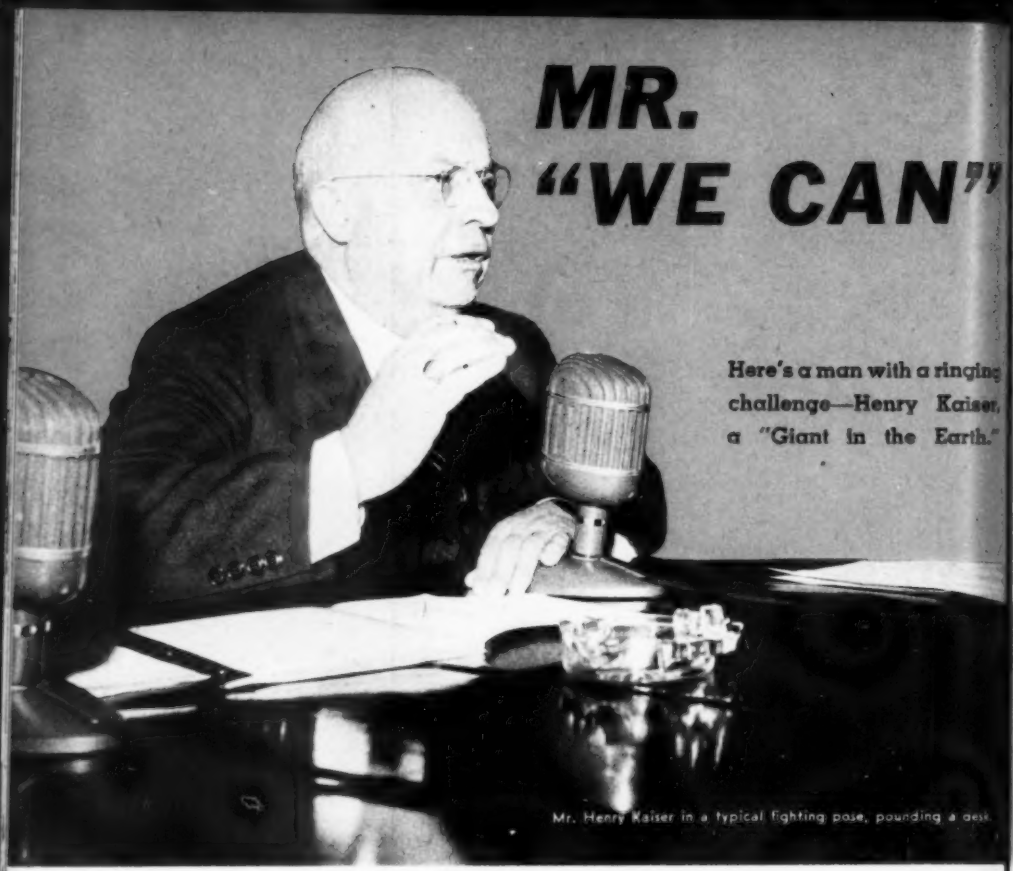
Indians, it seemed, were the trouble—and a burning itch that a golden fortune would bring to anyone. Nor did Pedro's tale of yet more gold change their minds.

"We already have enough for a lifetime," Ramon and Manuel explained. "And we have decided to go far south of the village Tucson where cattle flourish and establish a great *rancho*. For each day more savages come to prowl about and harass us. Soon we shall be overwhelmed. Then what of our gold and our plans?"

"We part then," Pedro said, "because I plan to go home and bring back a large expedition to work the mines. So let us divide all equally with a fourth part for our father, and I will give you each a map should you decide to return."

And the two copies [*Continued on page* 168]

MR. "WE CAN"



Here's a man with a ringing challenge—Henry Kaiser, a "Giant in the Earth."

Mr. Henry Kaiser in a typical fighting pose, pounding a desk.

by Joseph Arthur

THE bald giant grinned broadly at the austere members of the Senate Committee.

"That's a lot of bunk, gentlemen," he boomed. "For Americans, there's no such word as 'can't.' We can do it, if you'll just give the word. You say we haven't got the chrome and steel. I say, 'We'll find it!' You say we haven't got the engines. I say, 'We'll make them!' You say we haven't got the skilled men. I say, 'We'll produce them!' I'm getting tired of this word, 'can't.' We've got no use for it!"

Thus spoke the man who had out-built the Cheops of Egypt. And as he spoke, a breath of hope swept through the stuffy air of the Senate Committee room and was felt across the length of the country by Americans who had been waiting many months to hear some leader voice such typically American words.

And in that cheering breeze there was not the faintest part of "hot air." For the man who spoke those words of optimism was the greatest builder, the greatest doer the world has ever seen—Henry J. Kaiser.

And the country wondered, Who is this Henry Kaiser? Where has he been all this time?

From the press, they learned a few fables about him. But most of the facts were as bald as Henry Kaiser's dome. The people knew, vaguely, that Henry Kaiser was the man who built Boulder Dam; that he was the man who dropped a shovel one day and started turning out Liberty Ships the next day, at breakneck speed.

They knew he was the man who was now proposing to build 5,000 huge cargo-carrying airplanes, so that the United States might out-wit Axis submarines.

They knew, too, suddenly, electrifyingly, that here was a man who dared to shout and

bang the table and say, "Boo!" at the clouds of frustration and the miles of bureaucratic red tape which were bogging down America's war effort.

They thrilled to hear an American declare, "We can!"

Suddenly, too, they felt that they had a leader—and the clamor went up, "Who is he?"

Well, who is Henry J. Kaiser, anyhow? MECHANIX ILLUSTRATED asked me to find out for its readers. I talked to him and to the people about him, and to the men who work for him. What I found out makes about as refreshing a story as any you've heard for a long time.

First of all, of course, he's a builder. But I wonder if you know what kind of a builder America has in this man?

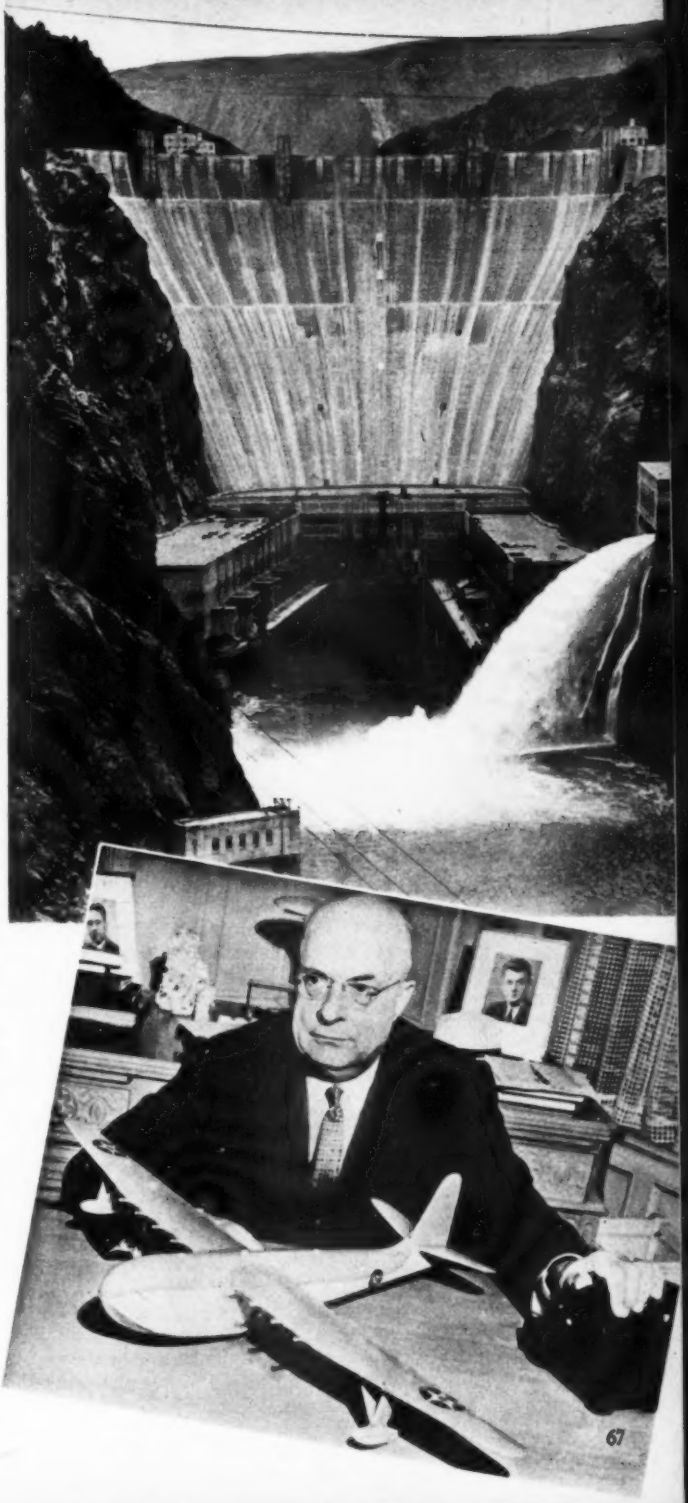
A few brief facts to let you grasp something of the picture of this up-to-now obscure American:

1. He built Boulder Dam —completing it two whole years ahead of contract date.

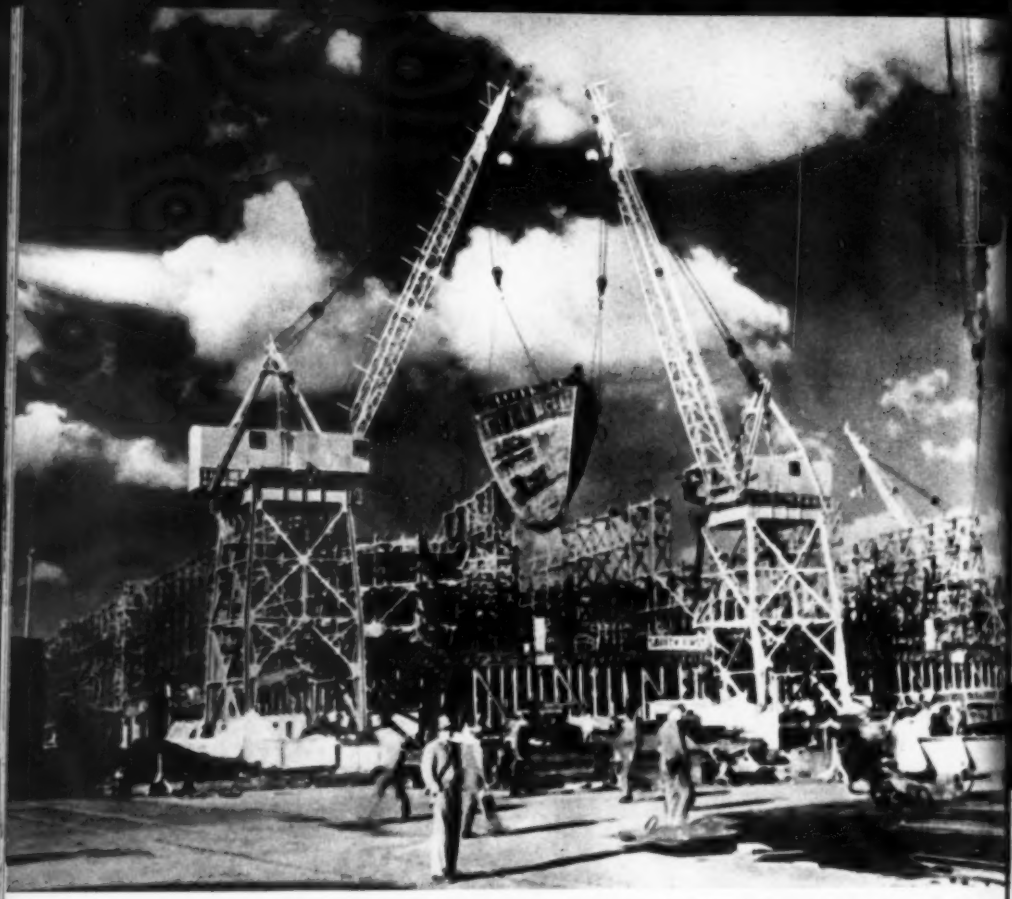
2. He then tossed up the Bonneville Dam—called the most daring piece of engineering in history.

3. Hardly batting an eye, he then built Grand Coulee Dam—the biggest thing ever constructed by the hands of man in the history of man!

4. Challenged by the "trusts" during his construction work, he put together his own cement manufacturing company, and in a few months turned out 5,800,000 barrels of cement—producing it 46 cents a barrel cheaper than the "trusts" could produce it!



Kaiser dreams big dreams—and turns them into actualities. *Above:* Boulder Dam was one of his early works—a project bigger than the Pyramids. *Right:* Kaiser with an airplane cargo ship model. He'll build 'em by the hundreds.



Here's how Henry Kaiser builds ships. Discarding all the conventional ideas, he puts them together in huge sections.

5. Again challenged by Washington officials who said, "There isn't any steel available for West Coast construction," Kaiser set out 10 months ago to manufacture his own steel! He "discovered" coal in Utah, iron ore in California and scrap on the West Coast. By this month, he expects to be turning out 750,000 tons of pig iron and 400,000 tons of steel plate!

6. Hearing that it was "impossible" to get magnesium for the huge West Coast aviation industry, he built a great plant at San Jose, California, and is now turning out 40,000,000 lbs. of magnesium annually!

7. Never having been in a shipyard in his life, he put together his own shipyards on the West Coast less than 18 months ago and is now producing *one-third* of the entire U. S. shipbuilding output! His yards are now splashing *a ship a day* into the Pacific Ocean!

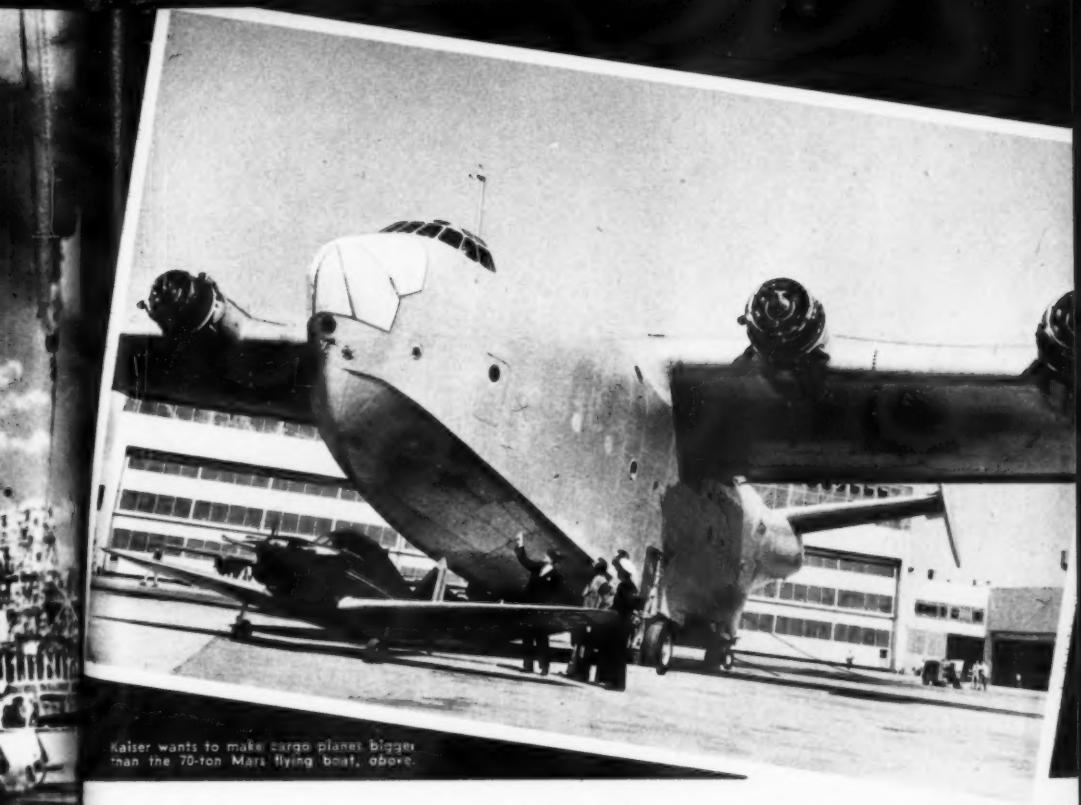
Amazing? Incredible? Maybe it is. But Henry Kaiser does it easily. He thinks it could be done by any American. And he does it quietly—only getting mad when someone tells him it can't be done!

"It's just a problem of handling heavy materials," he grins. "Anybody can do it if he will only believe he can."

And now, just as casually, Henry Kaiser says he will build 5,000 great cargo-carrying airplanes for America—planes to span all the oceans and set down thousands of tons of guns and ammunition and war supplies where they are needed, and *when* they are needed.

To the outraged brass hats who point out that Kaiser has never built an airplane, he says—with his customary grin, "Why can't I do it? I never built a ship until a short time ago, either. The things I've known least about are the things I've done best. That's the way it is with any good American."

This one trait alone, I believe, is the key to



Kaiser wants to make cargo planes bigger than the 70-ton Mars flying boat, above.

all of Kaiser's successes, and the factor which convinces me that Kaiser will build 5,000 cargo planes for America—come hell, high water, Senate Committees, "brass hat" opposition or any other thing.

This trait of which I speak is Kaiser's ability to "think big." He says, "America is big. America can do anything." He believes it. And, especially, he believes sincerely that Henry Kaiser can do anything.

There is nothing else in Kaiser's background to explain the fact that he has accomplished roughly five times as much building, in one lifetime, as did the four Pharoahs of Egypt who built the Pyramids.

Kaiser was one in a family of four children born in Canajoharie, N. Y. He had very little formal education, and during the early years of his life batted around from job to job rather aimlessly. He was a young man typical of most of the readers of MECHANIX ILLUSTRATED —interested in puttering with tools, fixing and building things. He liked to take pictures, and from time to time made a small living taking commercial photographs.

It was during one of these periods, while Kaiser was picking up a few dollars taking snapshots of summer visitors at Lake Placid, N. Y., that the thing happened which was to change his life. He fell in love.

Miss Bessie Fosburgh, daughter of a well-to-do lumberman from Roanoke, Va., was visiting at Lake Placid. Kaiser took her photograph—and fell in love with her.

When young Kaiser asked for Miss Fosburgh's hand, Father Fosburgh had some well-defined ideas on the subject. No man was going to marry his daughter, Mr. Fosburgh said, until that young man had a regular job and was earning at least $125 a month.

Kaiser had his first contract to fulfill. He pitched into it as he has into every job since. He went to Spokane, Wash.,—then a booming Coast town—and set to work. Within a year, he was back again to ask for Bessie Fosburgh's hand. He had his job. He had his salary of $125 a month. And he had already built, furnished and paid for a home in Spokane for his bride!

New cities were springing up like mushrooms on the West [*Continued on page* 173]

Bing Crosby's Victory Lab

by Andrew R. Boone

Bing sings to help run a testing lab.

EVERY time Bing Crosby croons the tones that trademark him from a phonograph record, movie soundtrack, or radio, more dollars are added to the fund with which he and his brothers have endowed a veritable victory laboratory in Pasadena, Calif.

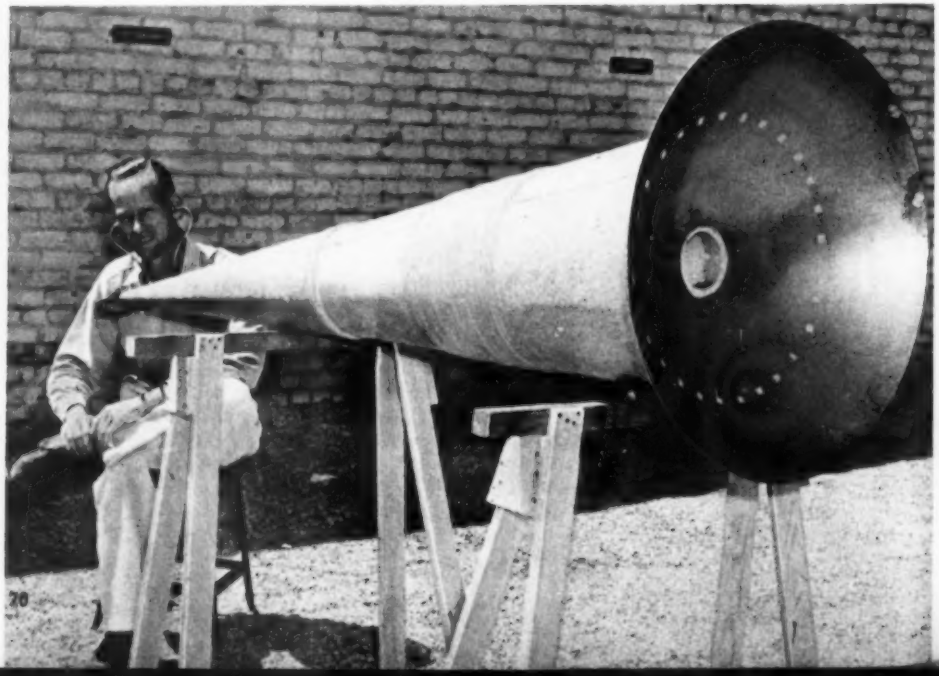
It all started about two years ago during one of the business conferences of Bing Crosby, Ltd. They are also family conferences, for Bing's manifold activities now enlist the services of father Harry L. Crosby, business-manager brother Everett, science-minded Larry, and orchestra-leader Bob.

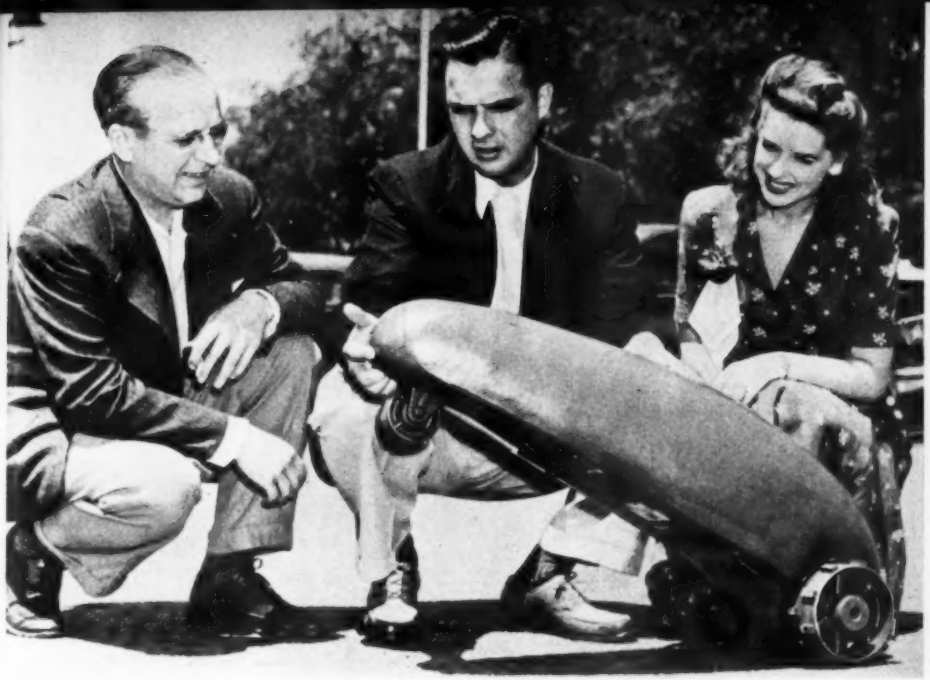
"Time's coming when America's got to help lick the Axis! We've gotta have some new inventions to help turn the trick." Larry Crosby pounded the conference table earnestly. The other Crosbys present nodded agreement.

"Don't know what they'll be, but we'll find 'em," Larry went on. Showmen Bob and Bing wondered just how their interests and extra funds could combine with new inventions to help Uncle Sam's approaching war effort. "I haven't got the answer yet," Larry admitted, "but I'll come up with something."

That "something" is hitting on sixteen cylinders today. It's a sorcerer's workshop with modern touches—a clearing house for inventions. Larry, fronting for Bob and Bing, and his aides have examined no fewer than 15,000 ideas, some screwy, some workable. From those thousands 100 were found by H. Lloyd Prager, manager of the Crosby Research Foundation, California Institute of

The Crosbys helped inventor Charles LaMar with this "plane detective." It picks up high-frequency vibrations the instant of origin.





Bing's brothers, Larry and Bob, and Patricia Hyatt inspect "blind pig," radio-directed miniature tank packing 25 lbs. of explosives.

Technology physicists, and other experts, to be meritorious.

Five are in production for use by the military and naval forces, and six are being developed.

"But those five!" says Prager. "Any one will save enough lives or speed production or perform some other function well enough or fast enough to justify all the money and effort the Crosby brothers have poured into these experiments."

Larry rented a suite of upstairs offices in Pasadena, up California Street a skip and a jump from Caltech, so famous scientists could be close at hand for conferences. He announced through the newspapers that his experts would talk to any inventor or any individual with an idea, no matter how absurd it might seem. Gradually Larry and Prager worked out a policy aimed at getting promising inventions in production in a hurry. That's the way they work today; develop the idea, get it in production, then offer it to the government. "From idea to market in 90 days," is their slogan.

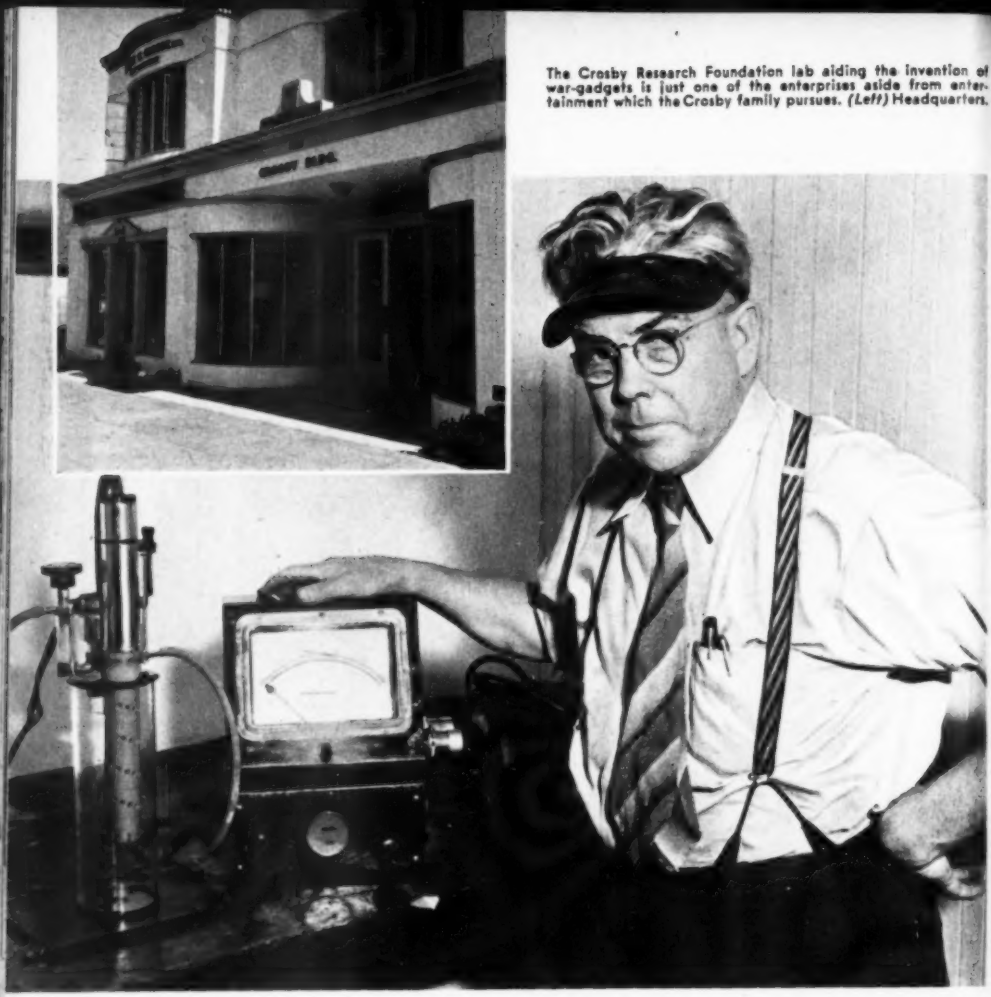
Finding a good invention and making it work is like finding a needle in a haystack. Larry Crosby doesn't believe in pure research just to see what may develop, not during wartime at least. "You can't invent and sell civilian articles nowadays," he explains, "so we work backwards. We start with the ultimate use in mind when evaluating some inventor's brain child. Will it be useful? How, by whom, and for what purpose will it be used? Will its use justify costly production? Can production facilities and material be made available immediately, and not next year? Can enough of the item be turned out to be widely useful?

"If the answer to all these questions is 'yes,' we try to develop the gadget and get it going."

You won't learn much about the inventions from Crosby lips. They're mum, mostly because the Army and the Navy don't want anyone to talk about things that might help beat the enemy. I can, however, give you an insight into the "mighty little gadgets" now hitting the production line. They're going to mean a good deal to the soldiers and sailors and fliers on the fighting line. They're good. But success with a few doesn't turn the heads of these hard-boiled experimenters. Prager is working day and night with 150 others that look practicable. "Maybe we'll get one hot-shot out of that number," he hopes.

Four especially interesting ones are:

1. A new fluoroscope which will save 50 percent of the time required to operate on a wounded man near the field of battle.



The Crosby Research Foundation lab aiding the invention of war-gadgets is just one of the enterprises aside from entertainment which the Crosby family pursues. *(Left)* Headquarters.

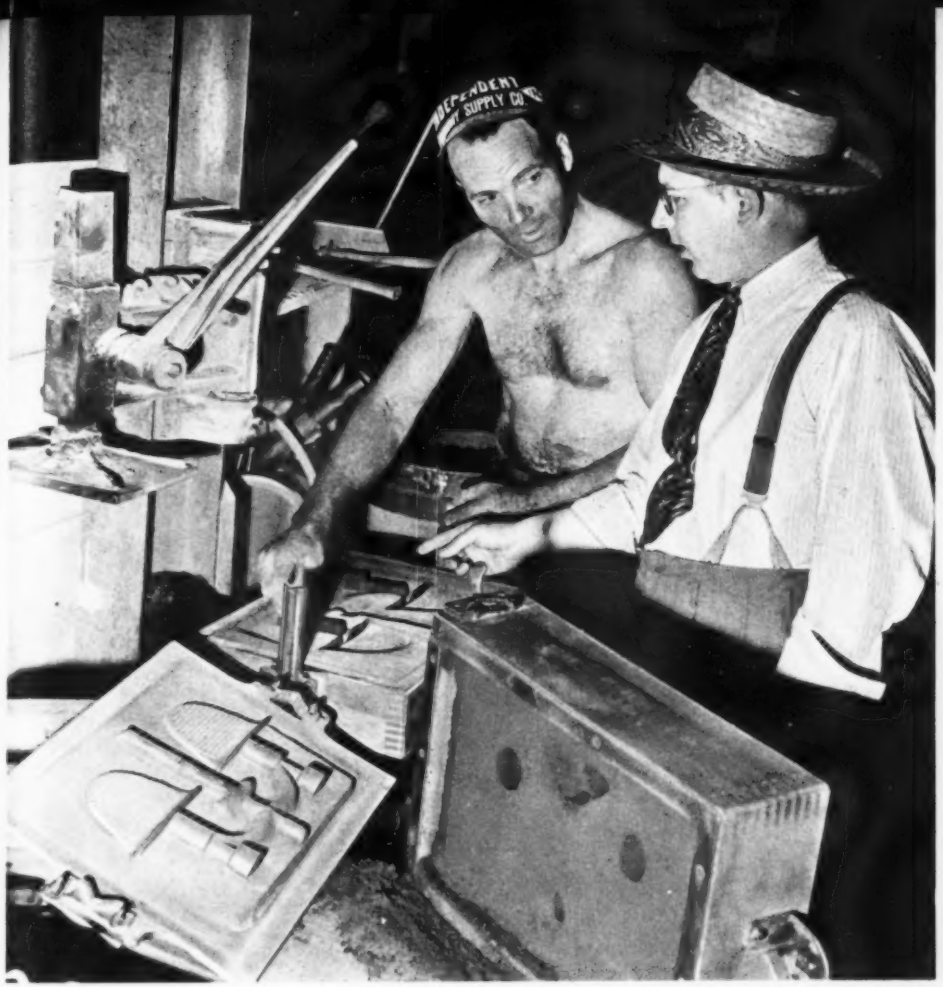
Ernest G. Ashcraft developed this electrical hydrometer, useful on subs to determine battery power, at the Crosby lab.

2. A blind fastener for airplanes.
3. An improved arc welding method.
4. An instrument which indicates the formation of ice on aircraft. This quartet is in addition to a secret military device on which they're working.

About that fluoroscope. As on the others, details are restricted. The first one is now being built, and early tests indicate it will save both X-ray and surgical time by enabling the surgeon to see deeper into the human body in quest of foreign objects, as shell fragments and bullets.

If an operation normally would require an hour, with this device the injured man will lie on the operating table only 30 minutes. This time saved in many cases will spell the difference between life and death! An unknown inventor walked in one day to Prager's office and displayed an unusual little gadget scarcely larger than your thumb nail. "With this," he declared proudly, "you can fasten an engine cowling, or any other metal sheets, from one side only." Prager turned it over in his hand. "On the front," the inventor continued, "is an indicator that shows when it's locked in place."

It wasn't long before Army experts at Wright Field, Ohio, were subjecting the device to extraordinary tests. In a period of weeks it underwent the equivalent of 165 years of actual flying, and came through without loosening its hold. One manufacturer recently tooled up to turn out 3,000,000 a



Outgrowth of the lab is a foundry where 40 aluminum plane parts are cast. Larry Crosby inspects a step-plate mold.

month, and others are getting ready to make more millions.

(The MECHANIX ILLUSTRATED Advisory Inventions Board points out that small devices like this fastener are the sort to which amateur inventors should devote their minds and energies if they wish success in aiding the war effort. They're within the experiment and test range of the small inventor. Big, complicated projects like torpedo shields for ships, unique weapons of various kinds, and others involving vast expense and research are best left to the special talents and resources of the huge corporations and the government.)

The arc welding development involves a new type of electrode holder. With it, Crosby says, an office boy can learn in a few hours to do as good a welding job as an old-timer who's been in the game for years. War workers in plants from Atlantic to Pacific will get their hands on these holders in a few weeks.

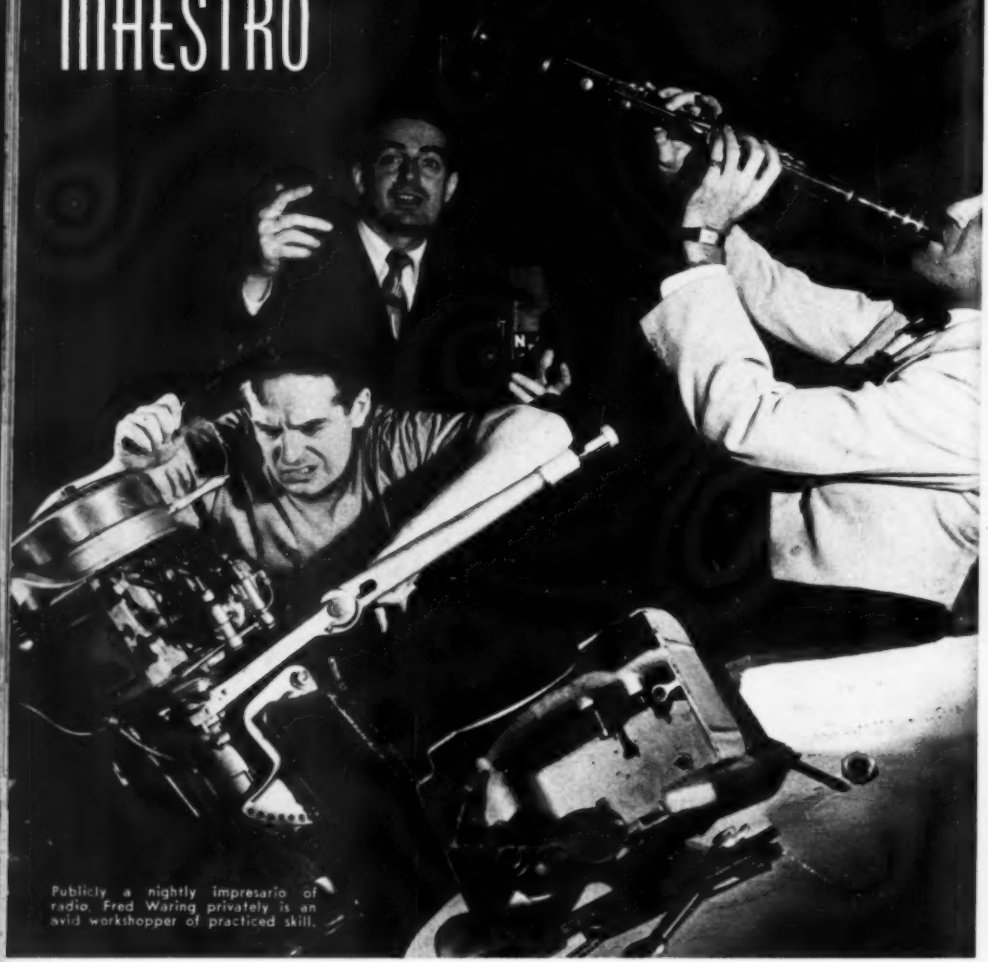
Not long ago another nameless inventor walked into the Pasadena office. Like the man with the fastener, he had a gadget for indicating something, he wasn't sure what. From his own experience, Prager immediately saw possibilities of a sensational aircraft application. He knew that fliers have prayed for a reliable ice indicator every since they began thumping planes through cold weather.

"Go home," he advised his visitor. "Play with that thing a while. And when you come back, make sure it will detect ice."

Five weeks passed, [*Continued on page* 178]

WORKBENCH MAESTRO

Orchestra and Song Leader Fred Waring engineers ideas into working devices!



Publicly a nightly impresario of radio, Fred Waring privately is an avid workshopper of practiced skill.

by Louis Hochman

IF YOU tune in on the radio any weekday evening, you can hear the soft strains of music coming from Fred Waring and his famous Pennsylvanians. But if you drop in at the Waring home in Pennsylvania over a week-end, you'll most likely find the famous band leader down in his basement workshop, either designing some new gadget for his home or actually engaged in building it. Fred Waring, the maestro of song, is as rabid a home workshop enthusiast as ever coped with a coping saw!

His basement, which he remodeled from a dirt-floored cellar, is complete with a full set of power tools, a lathe, grinders, band-saw, saw table, planer, belt sander, drill-press, mitre saw, etc. Lumber racks are kept well stocked. A sturdy, well designed workbench,

which he built himself, stands against a wall partition on which more than a hundred glass jars keep his assorted nuts, screws, bolts, etc., in a tidy arrangement.

Waring has carried his enthusiasm far beyond the average home workshop tinkerings. He has developed several devices which he's patented, placed on the market, and already sold by the hundreds of thousands!

One is the Waring Aluron, a new-type steam iron which operates on an entirely new iron technique. Its water reservoir is insulated from the heat and remains cool. Steam is generated at will by permitting a drop of water to fall at a time on the hot plate, where it is instantly broken up into steam and forces its way down through the material being pressed. A new system of controlled temperature and moisture eliminates the need for using pressure when ironing. All that is necessary is to steer the iron lightly along the garment. More than 100,000 of these irons have been sold during the year!

Another development of Mr. Waring's is the "super juicer" known as the Waring Blendor, which takes any foods, such as vegetables, fruits, cheese, meats, eggs, seafoods, and turns them into juices! Its motor-driven blades pass through the bottom of a specially-designed, clover-leaf-shaped glass container in which the foods are placed to be converted into a palatable drink. Guests at the Waring homestead

Vegetables go in, blended juice comes out of the Waring Blendor which its developer is shown filling above for his family and a guest. *(Below)* Mrs. Waring receives tips on using the steam iron credited to her husband.

Like most workbench enthusiasts, Waring neatly keeps nails, etc., in scores of bottles but gets the bench cluttered!

quench their thirst by drinking bananas, carrots, lettuce, and various other Waring specialties, whipped up in the host's Blendor!

So successfully does the unit operate that many of the country's top ranking Universities and Research Laboratories are using it in their virus research for making serums and vaccines! Research men in the laboratories of Parke, Davis and Co., use the Waring Blendor to homogenize large quantities of previously-infected chick embryos, for final virus suspension, which may be used for preparation of vaccine.

The Blendor is also used in the laboratories of Rockefeller Institute, University of Michigan at Lansing, Mellon Institute, the Department of Agriculture, etc. The Army uses it in their food-testing labs to test the foods being sent to soldiers. More than 200,000 of the blenders have been sold by the Waring Corporation, which Fred founded. The Corporation does a million dollar business annually.

The wood-walled and concrete-floored workshop which Waring has made of his dirt-floored basement is equipped with the best, as the power-driven drill-press, saws, and shaper in photos *below* and *right* indicate. He made his workbench himself

Shoe compartments, double-deck suit-rack, and other aids to closet orderliness are products of the radio star's hobby.

Fred studied engineering at Penn State College during his earlier years, and has never lost his talent and interest in that field. Everywhere in his home can be seen evidence of his ingenuity and skill with tools. During the years he "lived in a suit case" while touring the country with his band, he learned the value of space and has built many ingenious devises for utilizing waste space. When he raids the ice box in the small hours of the morning, he doesn't have to stoop to get into it, for his refrigerator stands majestically on a raised platform in the form of a cabinet stand. He built it with two drawers to get additional storage space while making the refrigerator's contents more comfortably accessible.

His clothes closet is fitted like a scientific kitchen, every inch of space being utilized to the best advantage. A double decker clothes rack made of chromium tubing supports his suits. Alongside it, he's built rows upon rows of specially-designed compartments to accommodate his and Mrs. Waring's shoes. At an instant's notice, he can walk into his closet and select any suit or pair of shoes he wants without fumbling searches like most men.

For traveling, he designed a trunk that opens up into a fully-equipped bar, containing all sorts of makings for drinks, ice, ice chopper, juice extractor, Blendor, glassware, in fact, everything that an average bar has!

People may wonder about the type of gift a popular band leader would appreciate most, but friends of Fred Waring have no trouble. When Christmas came around, the boys of his troupe got together and bought him a bandsaw. For a birthday present, his wife gave him the best set of drafting instruments she could find. Fred spends much of his spare time (of which he has very little, however), at his drawing board, designing improvements for his house. Recently he remodeled his country home, building new wings, a sun parlor, and a patio with outdoor fireplace, and did most of the work on a two-car garage. He planned all the construction step by step on his drawing board before tackling the job.

A large portion of his home is furnished with antiques which he made useable without destroying the antique beauty. He made a picturesque table lamp from an old watering can. An antique butter churn serves as a floor lamp base. Two [*Continued on page* 173]

Putting the household's refrigerator on a cabinet gave Waring a "no stoop" model and gained extra kitchen storage space.

You're RIGHT — That's WRONG

Here are 25 statements, some of them true, the others false. The trick is to separate the *true* statements from the *false* ones—and it isn't as easy as it looks! Use a pen or pencil and check the correct box under each statement and see how you make out! After you've given yourself the test, try it out on friends and other members of the family and compare scores. They'll enjoy it and so will you.

Are you ready? Let's go!

1. Foods taste sweeter when they are thoroughly chilled.
   True ☐ False ☐

2. The cucumber beetle just dotes on cucumbers. They're his favorite food.
   True ☐ False ☐

3. Aviators can reach any height up to 60,000 feet if provided with enough oxygen.
   True ☐ False ☐

4. Ostriches are hunted in Africa for the diamonds found in their crops.
   True ☐ False ☐

5. Ten miles from the Panama Canal, it is 100 degrees below zero.
   True ☐ False ☐

6. "Relaxation Time" is among the 10 highest radio shows in popularity rating.
   True ☐ False ☐

7. Railroads can haul nine tons of freight one mile for each pound of fuel burned.
   True ☐ False ☐

8. The giraffe makes noises by clicking his tongue against his palate.
   True ☐ False ☐

9. A pound of unpopped popcorn still weighs a pound after it has been popped.
   True ☐ False ☐

10. Cockroaches make fine household pets and enjoy such status in a great part of the United States.
    True ☐ False ☐

11. Stilson is the name of a fine variety of English cheese.
    True ☐ False ☐

12. A radio condenser is used to condense electricity.
    True ☐ False ☐

13. The age of a rattlesnake is computed by the number of buttons on its tail—one for each year.
    True ☐ False ☐

14. Although an eel is slippery, it actually has abundant scales.
    True ☐ False ☐

15. A good housewife looks for viridity in spinach.
    True ☐ False ☐

16. The man who said, "That's a lot of hog sweat," meant, "That's a lot of nothing."
    True ☐ False ☐

17. Powdered milk makes a good fuel for Diesel engines.
    True ☐ False ☐

18. A man would weigh less at the Equator than at the North Pole.
    True ☐ False ☐

19. Be careful when you eat potatoes. Most potatoes are poisonous.
    True ☐ False ☐

20. All rubies turn green under the right conditions.
    True ☐ False ☐

21. The vasomotor is a favorite for use in midget cars.
    True ☐ False ☐

22. The clystron is used for smashing atoms.
    True ☐ False ☐

23. The large serpent which crushes its victims before devouring them is known as the Anaconda.
    True ☐ False ☐

24. The Crookes Layer was a famous hangout for criminals in medieval London.
    True ☐ False ☐

25. One of the most recently developed plastics is called meringue glacee.
    True ☐ False ☐

WHAT'S YOUR SCORE?

To get your score simply give yourself 4 points for every question you answer correctly and total the result. If your mark is above 90, you are exceptional; if it is between 80 and 90, you deserve high praise; if it's between 70 and 80, you're good; between 60 and 70, fair; and below 60—well, try again next month!

Answers will be found on page 168

NEWS OF SCIENCE AND MECHANICS

GOOD-LUCK FARM
MODEL POINTER DOG
TUNNEL TRAFFIC EYE
BOX-CARS OF FUEL

Growing Good Luck!

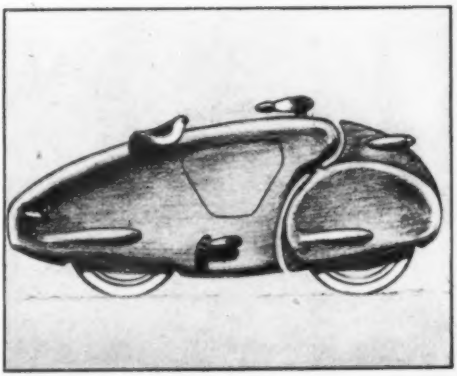
AS A hobby, for 17 years Charles Daniels continued his horticulturist father's experiments to develop seed consistently producing four-leaf clovers. Successful in his search, he now grows them on a farm in the Canal Zone as a profitable part-time interest. Scores of native girls pick, sort, press, and pack 5,000,000 of the clovers a year for luck-courting Americans. Daniels' two sons developed an electric press that flattens the clovers, preserves the natural green.

18-lb. Plastic Bike

A BICYCLE weighing only 18 lbs. (conventional models weigh 50) is shown in this sketch by industrial designer Jack Weber, N. Y. C. It uses a shell of moulded plastic plywood inclosing wheels and sprockets.

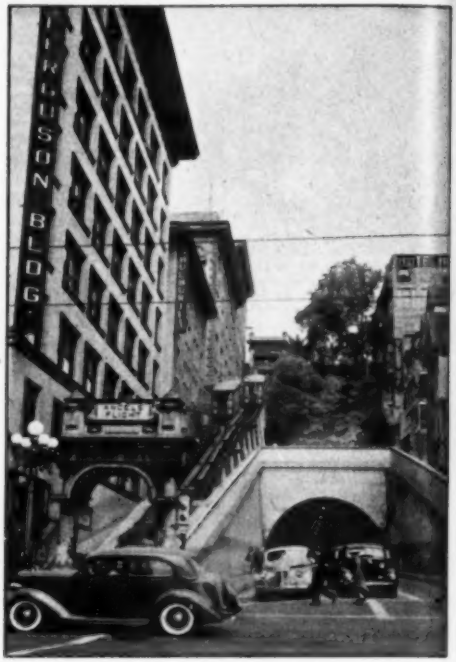
It would employ a wooden pulley of laminated birch with a V-belt, from an old tire casing, for a chain. Only about 13 ounces of metal parts would be used, according to Mr. Weber, who has copyrighted the design.

Betcha it would be tough pedaling on a windy day, though.



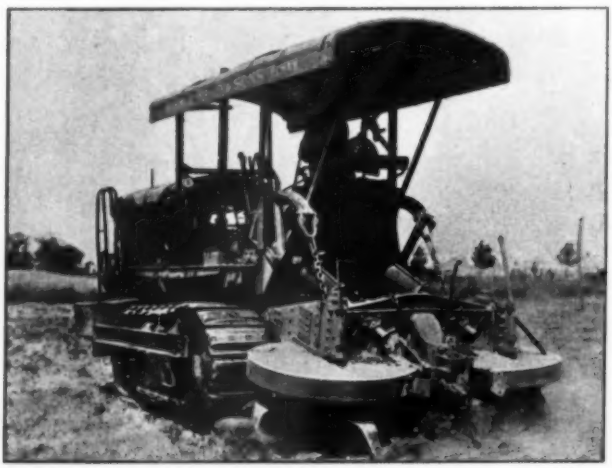
Synchronized Frying

COOKING of fried chicken and shoestring potatoes is synchronized by this automatic fryer so that both items are done at the same time and can be served piping hot. Twin "production lines," moving at different speeds through hot grease, are the secret. It's the "untouched by hands" idea in new guise. The meal is cooked in seven minutes flat!



World's Shortest Railway

LOS ANGELES' "Angels' Flight" is a 1c, 1-minute line—and is the world's shortest railway, one block long. Daily it carries about 4,000 persons 325 feet up or down the 33° incline between Hill and Olive streets. Built in 1900, it's a full-fledged commercial carrier, has to file operating reports just like the Santa Fe or New York Central!

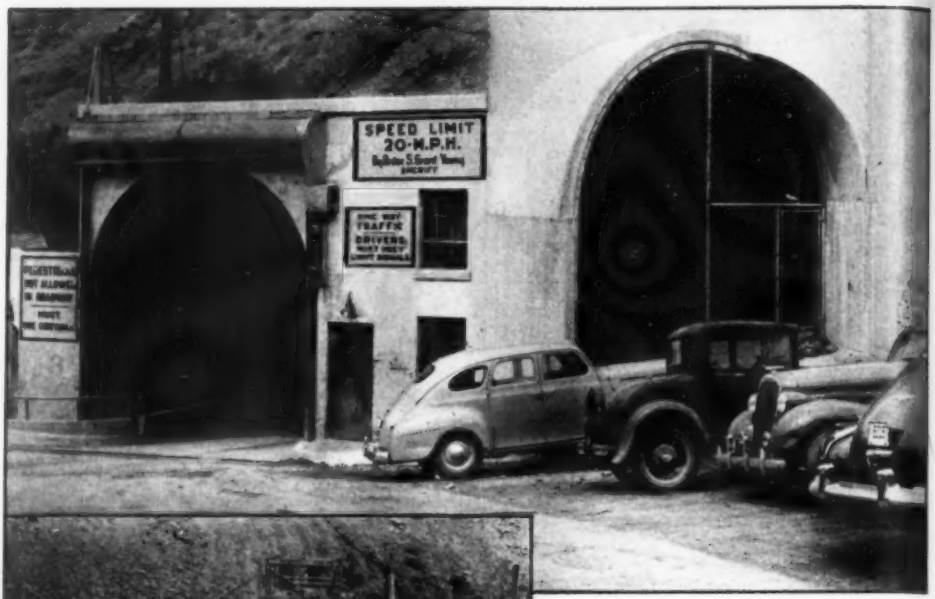


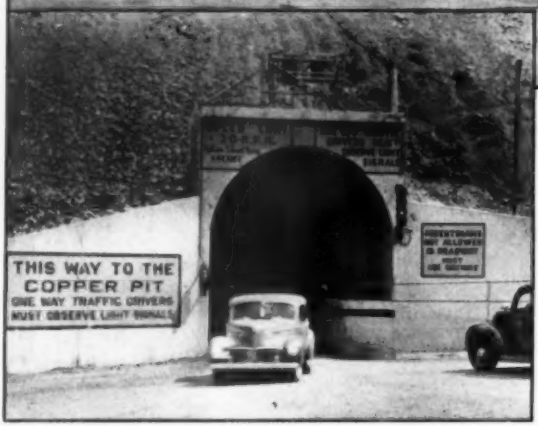
English Rotary Plough Churns Up the Earth

FARM machines like this unusual twin rotary plough are working overtime into the moonlight as British farmers seek to attain optimum food production at home. Already they have increased total food production from one-quarter (pre-war) of Britain's consumption to two-thirds of its consumption. This unfurrowing plough covers the ground rapidly and effectively.

This Dog Is a Model Pointer

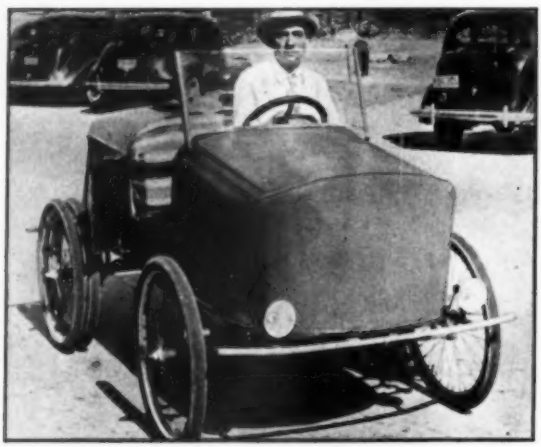
SINCE as many dog-owners today are model-plane builders and flyers as are hunters of ducks and partridge, here's the to-be-expected result: a dog trained to follow the flight of a model plane, be nearby when it lands, and watch it until his master arrives to pick it up. Specifically, the dog is Ricky, two-year-old German shepherd owned by Phil Abrams of Brooklyn, N. Y. *(Top)* Abrams adjusts the motor of his model in preparation for a flight before the alert Ricky. *(right)* The dog leaps into action as the plane flies off, and is watchfully waiting, pleased as punch *(bottom)*, when Abrams arrives to retrieve his model. He estimates that Ricky's presence frequently prevents someone from making off with a model before he sights it. Now if Ricky could only learn to fetch it. . . .





Electric Eyes Guide Traffic Through Tunnel

ELECTRIC eyes safely guide traffic through this Bingham, Utah, tunnel, saving cutting two lanes. If the CO content of the tunnel air rises beyond safety, traffic is stopped and a huge ventilating fan (top) starts running. The five-cycle electronic system rings for a patrolman if the cars leaving the 6,000-foot tunnel are fewer than those entering 5 minutes earlier.



When The Bicycle Weds The Automobile

MORE than a bicycle, yet less than an automobile—this vehicle which J. B. Heflin of Sonora, Tex., is patenting is kin to both. It has a motorcycle's engine and lamps, six bicycle wheels, but many of the accomplishments of an auto, as the ration-al substitute for which Mr. Heflin planned it. It's 7 ft. long, weighs 515 lbs., goes 45 miles on a gallon of gas. It'll go 50 m.p.h., too, Mr. Heflin claims. But if so, those tires must complain.

To Climb, Point The Motor

A FASTER-CLIMBING fighter plane is possible by mounting the motor on a movable front piece synchronized with the tail assembly, according to Andrew Sedlmeier of Oakland, Calif., who's spent 12 years on the innovation shown on this plane in his back yard. When the pilot wants to go up, he points the motor, and gets more propeller pull. Tail flaps go up at same time. Combined result: speedy rise. Sedlmeier's plane has never been in the air, however.

Canvas Ventilators Relieve Tanker Of Gas

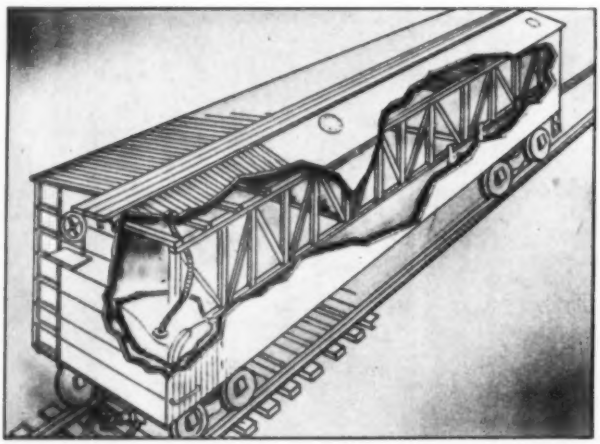
AFTER an oil tanker has discharged its precious cargo, dangerous gases remain in the tanks and must be blown out without delay because of the danger of explosion, fire, etc. To facilitate relieving the ship of these gases, canvas ventilators like those shown at right are suspended over the holds and faced into the wind. These lead fresh air inside, force the fumes out.

The Seamy Side Of War

WAR deprived the gals of silk stockings, so they resorted to leg makeup to present the illusion of hose. Next step was to further the illusion by imitating the seams, a task requiring painful neck-craning and an accurate eye until this gadget was devised with a screw driver handle, bicycle leg-clip, and an eyebrow pencil. The legs belong to Kay Bensel of Hollywood.

Wonderful Gasless Car

OWNERS of the Stanley steam-driven automobiles of fond memory have, if they still have one in running order, become even fonder of the cars in recent months as fuel became rationed. The 1910 Stanley shown above is one of several veteran motor cars belonging to singer James Melton, pictured pinching a tire worriedly at an antique auto derby held for United China Relief.



How To Cell Gas By Box-Car

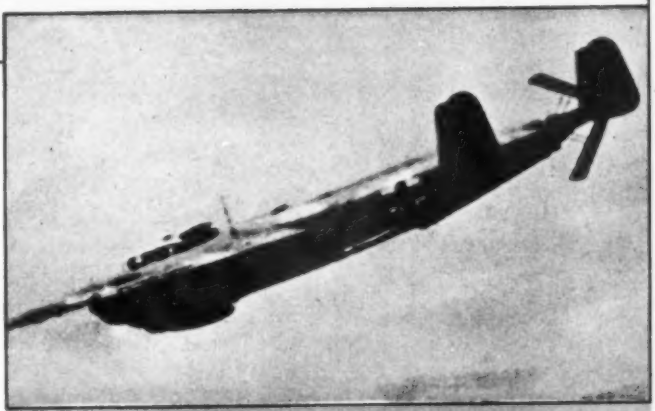
AN ORDINARY box-car could carry freight West, then be fitted with a collapsible tank of synthetic rubber to take oil and gas East. So argue makers of the Mareng cell, who say the same idea could be adapted to truck and barge use. Sketch shows how cell would fit a box-car. This expediency would increase the number of fuel carriers quickly, without using vital metals.

Tail 'Chute Brakes Nazi Dive Bomber

THIS unique picture sequence recently made shows the new German Stuka Dornier 217 dive-bomber plane, in three parts of a dive attack. The most interesting detail of the plane, and of the serial demonstration of it in use, is the tail-airbrake.

As the Dornier begins its dive (top photograph), the airbrake opens. It is in operation as the plane continues to descend toward the Dornier's objective on the ground or water, and exerts its full braking power at the lowest point of the dive.

On previous dive bomber models, the airbrakes were located on the wings of the German craft.

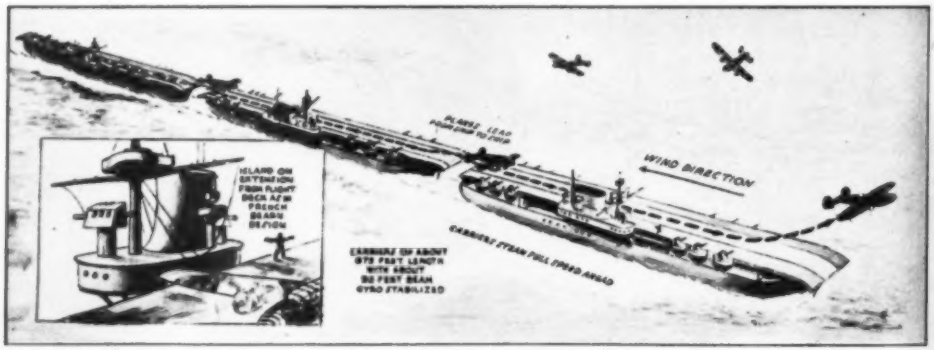


Lightning-Swift Thunderbolts

THIS is first flight photo of the U. S. Army's most powerful fighter, the Republic P-47 Thunderbolt. Specifications: 400 m.p.h. in level flight from an 18-cyl., 2,000-h.p. air-cooled radial engine driving a 12-ft., 4-blade propeller; weight: 13,000 lbs., almost as much as 2-engine P-38; wingspan, 41 ft. Army says it has "heavy armor," "strong fire-power."

Sandals For Shoes

THOSE victims of the war, automobile shoes, can smartly wear sandals, according to the proposal of the U. S. Rubber Co., which has developed the cotton carpet-like material shown above in application. After being treated with an asphalt-like emulsion, the sandal will give 3,000 additional miles of travel to the shoe underneath.

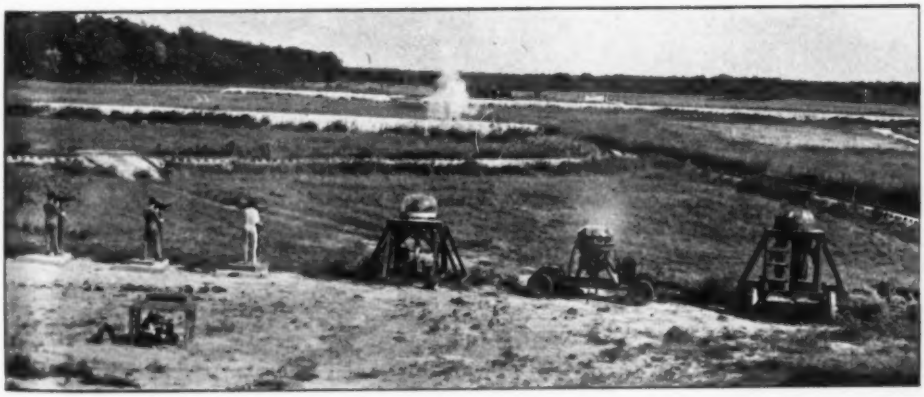


Hop, Skip, & Jump Takeoff For Heavy Bombers

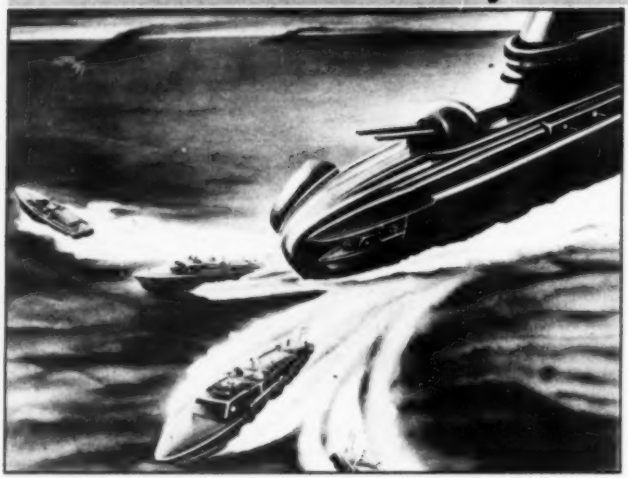
AT PRESENT impossible, launching heavy, land-type bombers at sea could be accomplished by lining up three medium-size carriers, according to this graphic presentation. The planes leap over breaks in the 2,000-ft. runway while gaining take off speed.

Train Target Trains Gunners

GUNNERY trainees from many U. S. Army bases go to Mulberry Island in the James river near Langley Field, Va., to sit in power-operated turrets like those on a real plane (right and below) and fire power-aimed guns at a target traveling past them on a railroad track at 40 m.p.h. The target is the outline of an airplane mounted on a specially designed, electrically driven car. It rolls over a system of tracks which can be set to give the target a variety of courses to resemble an enemy plane in action at that distance. Paint-tipped ammunition permits keeping individual scores, only the holes in the white section being counted.



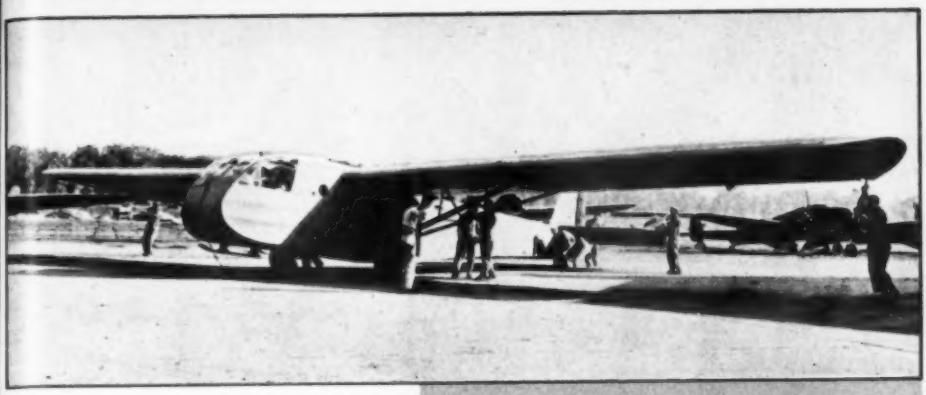
Streamlining the War



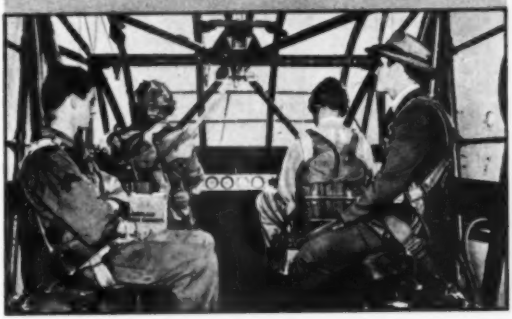
Speed, firing power, and armor feature new designs

THE advantage in this war being with the force that moves fastest, land vehicles have had a hard time keeping up with planes. A solution to the problem by George Walker, industrial designer, is greater streamlining and speedy, heavily armored vehicles of several functions. Mr. Walker is shown at left in his Detroit studio before a wall covered by designs for war machines, several of which were first shown in MECHANIX ILLUSTRATED for June, 1942. His latest proposals include a streamlined cruiser (top photo) which would carry 70-m. p. h. PT boats between its decks. In an attack, they are spewed forth and join in the battle at points more remote than their own range normally would permit them to reach.

A virtual fort on wheels is the vehicle in the lower photo, a troop transport with cannon and anti-aircraft guns punctuating the curved sides and top.



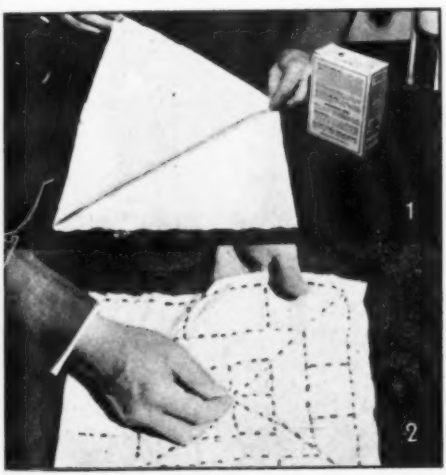
Army's Newest Glider Carries 15 Commandos

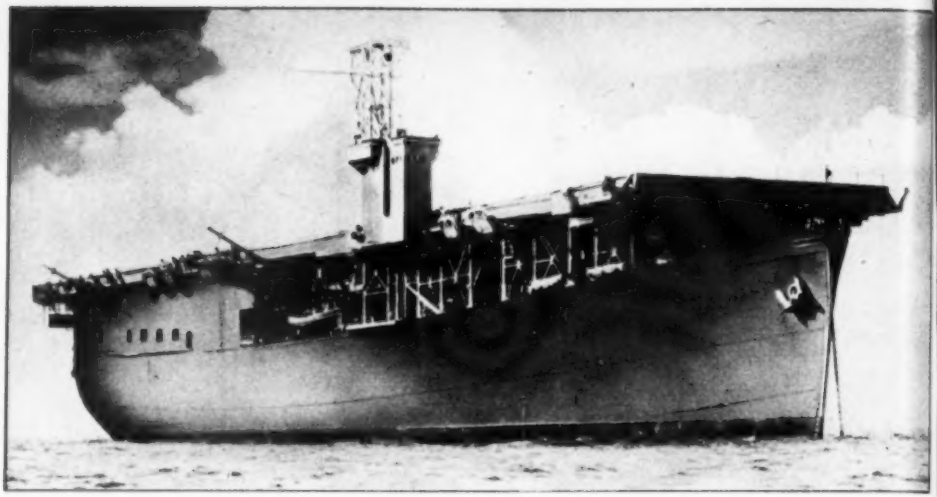


NOW in quantity production, the U. S. Army's new troop-carrying glider, the CG-4A, will silently whisk 15 fully-equipped commandos into advanced positions. It has a wingspan of 83 ft., 8 in., and length of 48 ft., 3 in. Interior view, right, indicates unusual roominess and the large view area given pilot and co-pilot.

How To Make Your Own Gas Mask

DR. KEARNEY SAUER, Los Angeles OCD gas expert, shows how to make your own gas mask (below). 1. Sprinkle baking soda ¼-in. thick between 12-in. squares of sheeting. 2. Sew edges to prevent soda's spilling and quilt roughly with criss-cross stitching to keep it distributed. 3. When needed, wet mask and hold firmly over eyes, nose, mouth.



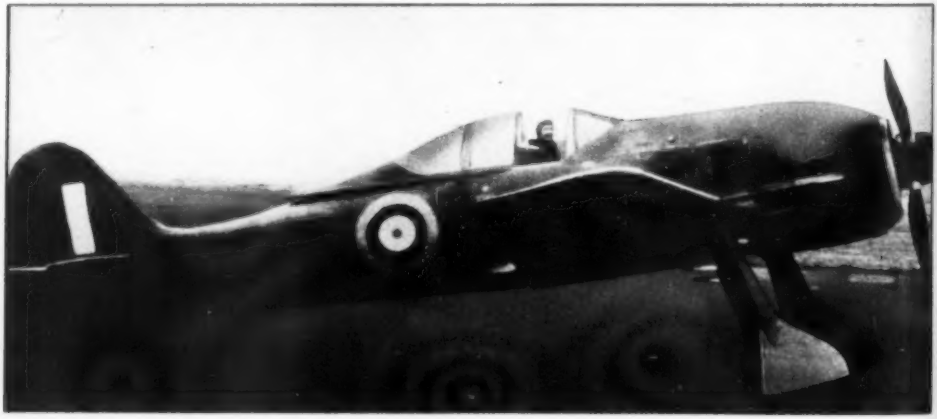


Roll-Top Deck Changes Freighter To Carrier

A FEW months ago a merchantman, this ship became a man-o'-war when its superstructure was realigned to accommodate a surface that goes into place like the top of a roll-top desk. It forms the take-off deck for a Douglas torpedo bomber, left. Now the ship has a new name, too: *U.S.S. Charger.*

Our Toughest Opposition: The Focke-Wulf 190

THE RAF captured this Focke-Wulf intact. The Nazi plane is conceded the best fighter now in action, exceeding the Spitfire. Specifications: top speed 375 m.p.h.; cruise, 326 m.p.h.; 1,600 h.p. from 14-cyl. radial engine; four 20-mm. cannon, four machineguns.

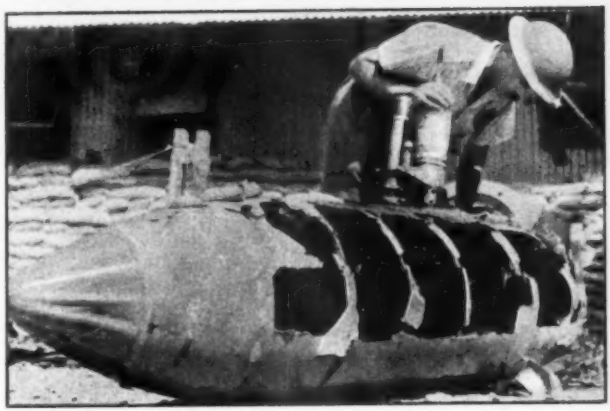


Sub's Inventor Urges Them To Carry Cargo

THE U. S. should build cargo-carrying submarines to offset the toll of freighters due to enemy fighter subs, Simon Lake, inventor of the craft, told a Senate military committee recently. He displayed this model of a proposed underwater freighter to interested legislators like Senators E. C. Johnson and Josh Lee.

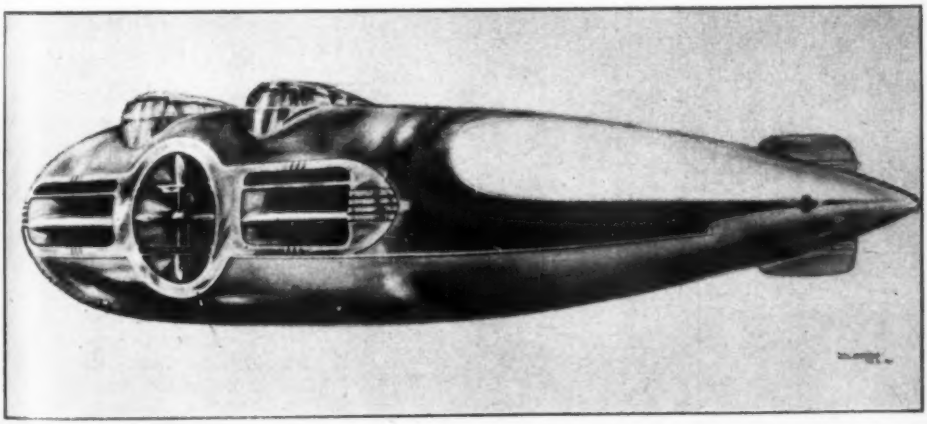
Zeros' Range Due To Plywood Belly

JAPANESE Zero fighter planes (see following page) gain additional range by carrying an extra supply of fuel in a belly tank like this wrecked one found in New Guinea. Made of plywood to save precious metal and holding 70 gallons, the tank when emptied is released from the plane's belly and thrust away by the mounting shown.



250-ft. Square Air Battleship

ONE of the designs for air battleships is the "Airwing," also in MI last month. It has propellers in an interior wind tunnel. Helium containers permit it to cruise at 10 m.p.h. and bomb subs accurately. Dimensions: 250 ft. square, 69 ft. deep.

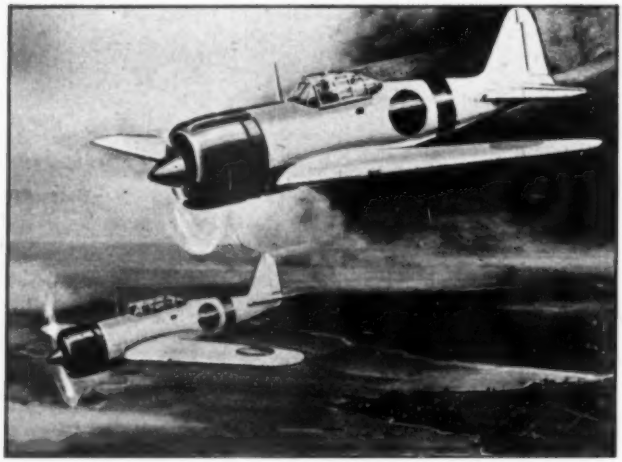


Ersatz Crash-Dive

THE Nazis' faking of food, clothing, oil, religion, et al, extends even to training plane pilots. Crash-dive conditions are imitated for dive-bomber candidates when they sit in this turning chair wearing a headbox and undergo sudden positional changes.

Oh No It Isn't!

MAE WEST in uniform? No. Superchested soldiers? Well . . . it's a soldier all right, but the unnatural expansion is due to a buoyancy balloon beneath his shirt. He and other U. S. "bushmasters" in Panama rely on them to cross streams easily.



Japan Shapes Its Zeros Like These

HERE is the first accurate depiction of the Mitsubishi 00 fighter to be published in this country. It was drawn by Herman R. Bollin from official war department photos of Zeros brought down by United Nations' action. The Zeros carry one 20 mm. cannon in each wing, plus two machineguns, mounted on the engine cowl, which fire between the propeller blades.

CRAFTS AND HOBBIES

PHOTOGRAPHY
MODELS • RADIO
THE WORKSHOP
HOW - TO - BUILD

1-MINUTE DEVELOPER TEST

by Lionel Hartman

AMATEURS, who use formulae or bottled developers which are recommended for a limited number of rolls of film, can make sure that they will not ruin a roll of film, by developing it after the developer has become exhausted, if they include one "check negative" in each roll for comparison.

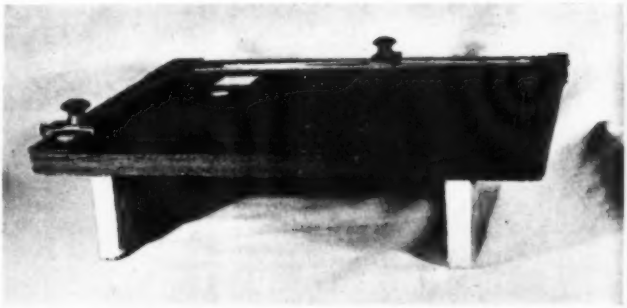
This check negative should be of a given subject, under standard lighting conditions, at a pre-standardized, "correct" exposure. Before a test can be made, the standard subject must be photographed and the negative developed normally in a fresh solution of the particular developer. [*Continued on page* 177]

Above: The author's "check negative" shooting setup. The darkroom safelight is converted in accordance with details in the text; before shooting the test the camera is placed at a distance from the far end of the yardstick identical to its minimum focusing distance. To prevent overheating, the safelight should be turned on an instant before shooting, then turned off. *Right:* Sandwiching negative between sheets of opal and clear glass—same size as safelight filter.

Right: How the "check negative" appears on the roll of film. Note that the result is a positive transparency since the standard subject of the test exposure is a negative. Compare this result with the transparency originally obtained with fresh developer.

AUTO-FOCUS ENLARGING EASEL

by Robert Scott



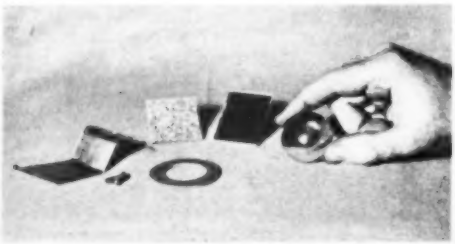
Right: The finished easel must be raised to accommodate the mirror beneath it. The part of the image falling on the square ground glass patch on the easel top is observed, enlarged, by looking through the circular hole.

FOCUSING the enlarger will no longer be a problem if you equip your easel with the built-in magnifier shown in the diagram and photographs.

Materials used are inexpensive and easy to obtain. They include: small square of ground glass; a plano-convex magnifying lens; a cardboard washer having an inside diameter slightly smaller than the diameter of the lens—to hold the lens in place; a small mirror; a strip of thin metal (the strip in the photograph was cut from a two quart oil can), and two small wood screws.

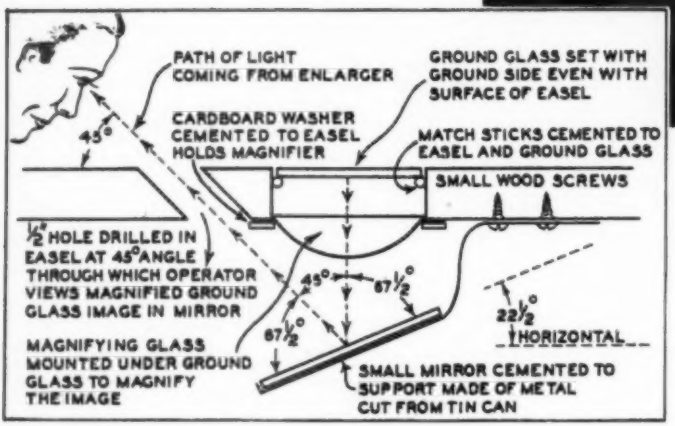
Care should be taken when cutting the hole in the easel to be sure the ground glass will fit in it neatly. Two match sticks are cemented slightly below the edges of this hole with airplane model cement. The ground glass is then cemented to the match sticks; its rough side should be up, and it must be even with the surface of the easel.

The magnifying lens is cemented to its cardboard washer and the washer is in turn cemented to the [*Continued on page* 173]



Left: These are the materials, in addition to the enlarger easel, required for the construction of the auto-focus easel. Included are a thin strip of metal to hold the mirror at a 45-degree angle; 2 small wood screws; a cardboard washer; a ground glass square; a small mirror, and a magnifying lens.

Above: This photograph shows a cross-section of the auto-focus easel. The mirror is tilted at an angle that will reflect perpendicular light rays from the ground glass screen, as magnified by the lens, through the diagonal hole drilled in the easel structure.


PATH OF LIGHT COMING FROM ENLARGER
GROUND GLASS SET WITH GROUND SIDE EVEN WITH SURFACE OF EASEL
CARDBOARD WASHER CEMENTED TO EASEL HOLDS MAGNIFIER
MATCH STICKS CEMENTED TO EASEL AND GROUND GLASS
45°
SMALL WOOD SCREWS
½" HOLE DRILLED IN EASEL AT 45° ANGLE THROUGH WHICH OPERATOR VIEWS MAGNIFIED GROUND GLASS IMAGE IN MIRROR
45°
67½°
67½°
22½°
HORIZONTAL
MAGNIFYING GLASS MOUNTED UNDER GROUND GLASS TO MAGNIFY THE IMAGE
SMALL MIRROR CEMENTED TO SUPPORT MADE OF METAL CUT FROM TIN CAN

Left: These are all the relevant construction details for the magnifying and viewing portions of the easel. Be sure to angle the mirror correctly in relation to the viewing path and, the line of vision from the ground glass screen. Follow directions carefully.

PHOTO CONTEST

FIRST PRIZE ($10.00): "Letter From Home" by Sylvia Hoffman, 3620 Fletcher Drive, Los Angeles, Calif. SECOND PRIZE ($5.00): "First Portrait" by J. V. Hilliard, 420 West 24th Street, New York, N. Y. Taken with a Speed Graphic, on Superpan Press film, in Agfa 17; 1, No. 21 synchroflash at 6 feet, f/20, 1/100 sec. THIRD PRIZE ($4.00): By Ed Arnold, 9 Winchester Place, Burlingame, Calif. Rollei camera, on Plus X film, in DK-20; f/16, 1/50th in afternoon sun. FOURTH PRIZE ($3.00): "Adolf in His Glory" by Paul W. Bentrup, 3634a Virginia Avenue, St. Louis, Mo.

The MECHANIX ILLUSTRATED Photo Contest is run on a month-to-month basis. If you did not win one of the four prizes in this month's competition, try again. Important considerations in the judging are the eye-appeal and subject interest of the photographs that you submit.

Submit monthly contest prints unmounted —no larger than 8x10 inches. Print your full NAME and ADDRESS on the back of each print and wrap securely with cardboard or corrugated stiffeners. With each print, list your camera, film, lens opening and shutter speed, illumination, and developer. Be sure to enclose return postage if you want unused prints returned. (Published prints can not be returned.) Address: Photography Editor, MECHANIX ILLUSTRATED, 1501 Broadway New York, N. Y.

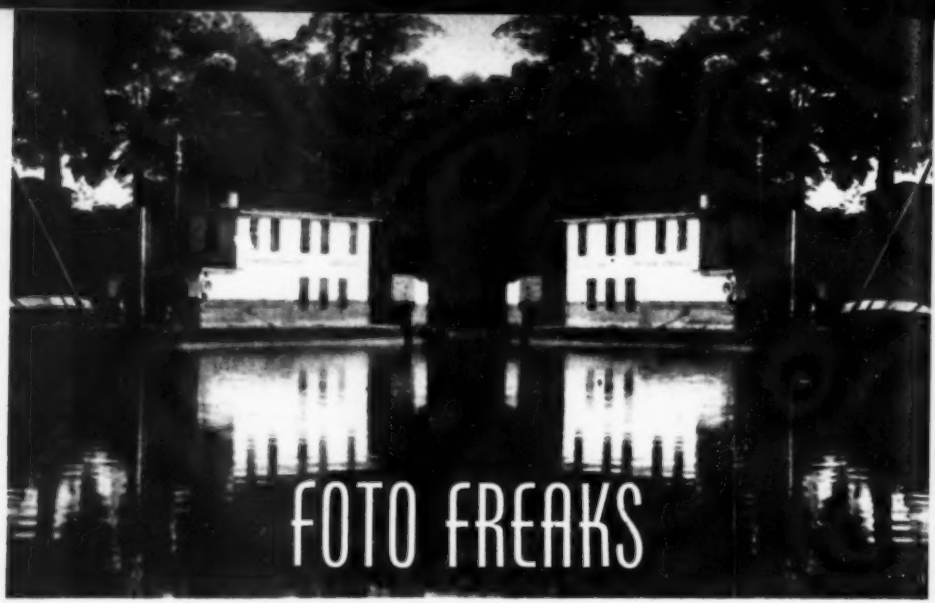


FOTO FREAKS

FIG. 1 *(above):* Here, the folded-print technique enhances the beauty of the subject treated. The dividing line has been retouched out and the tone difference is hardly apparent.

by Paul Hadley

TO THE amateur photographer who likes to make odd and startling photos, yet who has tired of such commonly-used methods as tabletops, distorted perspectives, composite "pasteups," etc., we suggest—"fold your printing paper!" Try printing from some of your filed negatives on the folded paper!

The results can be either beautiful, novel, or hair-raising. It depends upon the subject matter of the original negative—and, how you use it. Accompanying this article, are a few examples of the results the author got when

FIG. 2 *(above):* This shocking effect was produced from an ordinary negative of an acrobat going through a routine. The paper was folded emulsion-to-emulsion during the printing exposure. Fig. 3 *(right):* This queer creature is the result of a composite print copied and then printed by the folded paper method. The composite consisted of the head and neck of a blackbird and a small bird's body, sitting on a twig.

FIG. 4: Here's a variation of the rooster shot from which the photograph at the bottom of this page was printed. The paper was folded during the exposure.

he dug around among his old negatives, and tried out the new "folded printing" technique.

Figure 6 is merely a straight print from a rather average negative of a rooster's head. Nothing amazing here, you will agree. But look at Figures 4 and 5. These monstrous results were obtained by printing from the same negative, with the printing paper folded across the middle, before printing. Laying the paper in different positions on the negative, so that the crease bisected the image of the head of the rooster in different directions, resulted in two different unique prints. Many other effects were created by the author at the same time.

Folding the printing paper will necessarily put a crease in the [*Continued on page* 167]

FIG. 5 *(above)*: Another folded-paper photograph from the negative used in printing Figure 6 at the *left*. The paper was laid at right angles to the position used for Figure 4.

FIG. 6 *(left)*: Here's the straight print made from the rooster negative—the basis of the weird effects on this page.

MAGNIFYING VIEWER FOR SMALL SLIDES

by Frank Caporael

HALF the pleasure of making color pictures is in seeing the transparency to greatest advantage. Aside from projection, this is best accomplished with a magnifying viewing apparatus. Most efficient viewing devices are complicated and expensive. The viewer described here is simple and inexpensive. Most of the parts may be fashioned from odds and ends, and the cost should not be above fifty cents.

This viewer dispenses with the usual built-in light, and instead, uses a mirror to reflect light through the

Figure 1. The magnifying viewer is compact and very easy to use. Slides are pushed into viewing position through the slit in the side of viewer. Each succeeding slide pushes the "used" slide out as it is inserted.

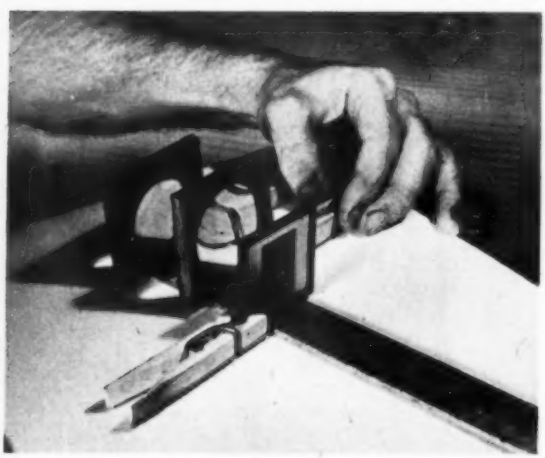
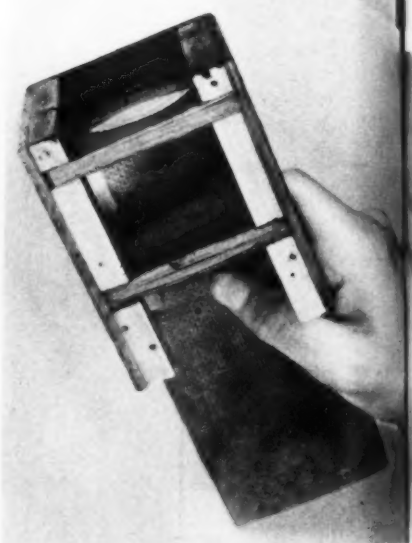


Figure 2. This is the experimental method of determining the distances between the condensers and slide holder. The lens at the end of the ruler is kept fixed; the positions of the slide and other lens are varied.

Figure 3 *(below)*: The lens-spacers are 3/8-inch square stock; they act as a foundation for the sides and the back in addition to holding the lenses in place. It's best to attach spacers to the sides before assembling the back and front.

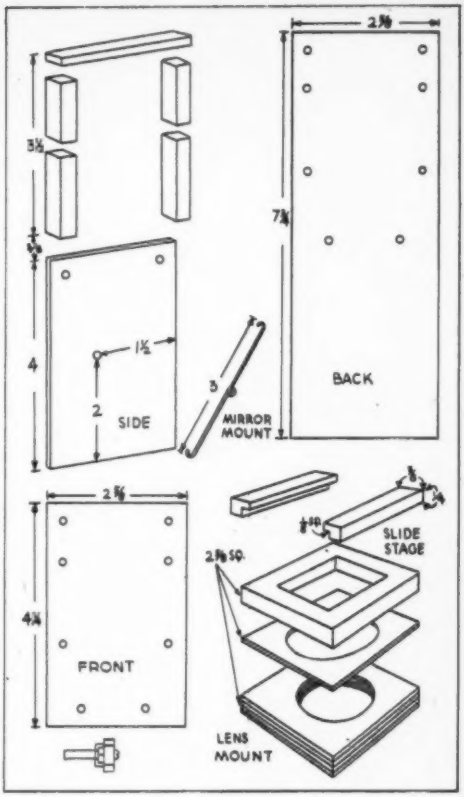


slide. The first consideration is the magnifying medium. In the apparatus shown, two magnifying lenses from the five and ten cent store were used. The lenses are of 6- and 8-inch focus. It was found that the combination of the two increased the magnification and decreased the distance necessary to bring the object into focus. Needless to say, the magnifying system is of fixed focus.

Since the focal lengths of the lenses may not be equal, one has to determine the correct distance between the lenses and the object. A simple trial and error method will quickly assure the correct distance.

It is easier to handle the lenses after they are mounted so we shall first describe this procedure. Cut several squares of heavy pasteboard to a size 2½ inches square. According to the thickness of the lens, a number of pieces are cut so that circles in the center just fit over the lens, including the frame. After the laminations are built up and glued together, cut two more pieces whose circular openings are slightly smaller than the diameters of the respective lenses. These two pieces are glued to either side of the pieces into which the lenses are set, thereby holding the lenses rigidly. A sharp knife or razor blade will cut the board accurately.

The respective distances of the lenses are determined as shown in Figure 2. One lens is held in a fixed position at the end of a ruler; the other lens and the slide are moved along the surface of the ruler until the settings of sharpest focus are found by looking through the fixed lens. [*Continued on page* 156]



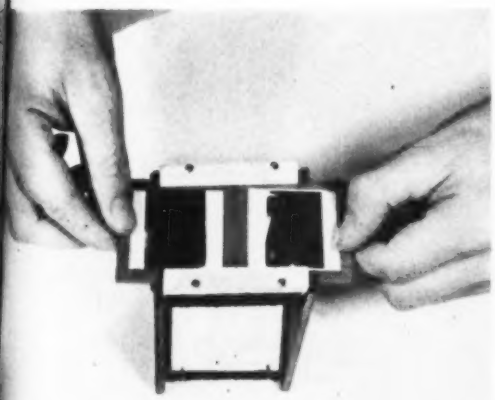


Figure 4. A pair of wooden channels are screwed to the slide stage to act as guides for the slide. Thus, each slide ejects the one that was previously in place, as it is a slid into place.

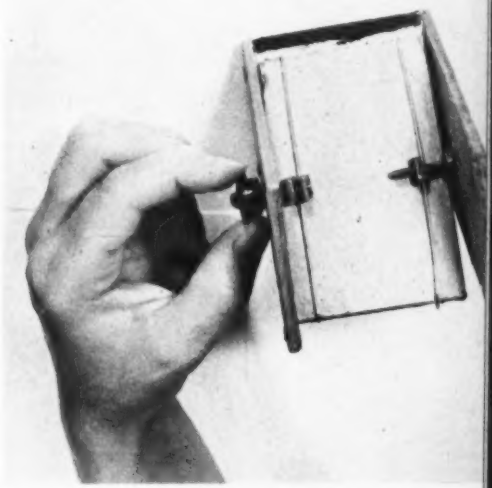
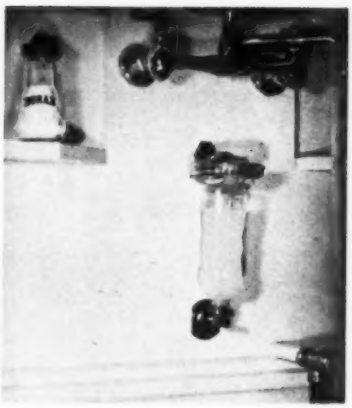


Figure 5. This shows how the looped piano wire holds the mirror in place and permits it to be pivoted by the knob. The mirror is made rigid by the cardboard slab mounted below it.

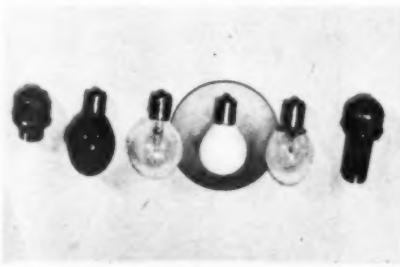
PHOTO SHORT-CUTS

CAMERA VIEW FINDER—A TELESCOPE. The optical view finder with which many cameras are equipped serves the purpose of a telescope with a magnifying power of about 2X when it is used backwards—that is, when the observer's eye is placed at the entrance end and the eye-piece is turned toward the scene to be viewed.—*Louis Heckman.*

DARKROOM HAND CARE *(right)*: A sugar-shaker full of borax and a liquid dispenser filled with hand lotion (Jergen's, Campana, etc.) can be put to good use in the darkroom to clean off stains and then to take the sting out of hands that have been in and out of solutions during a darkroom session. The borax is used like soap. If sensitive to alkali, dip hands in hypo before rinsing them in water or soaping to remove developer. Hypo neutralizes the alkali.—*A. J. Lockrey.*

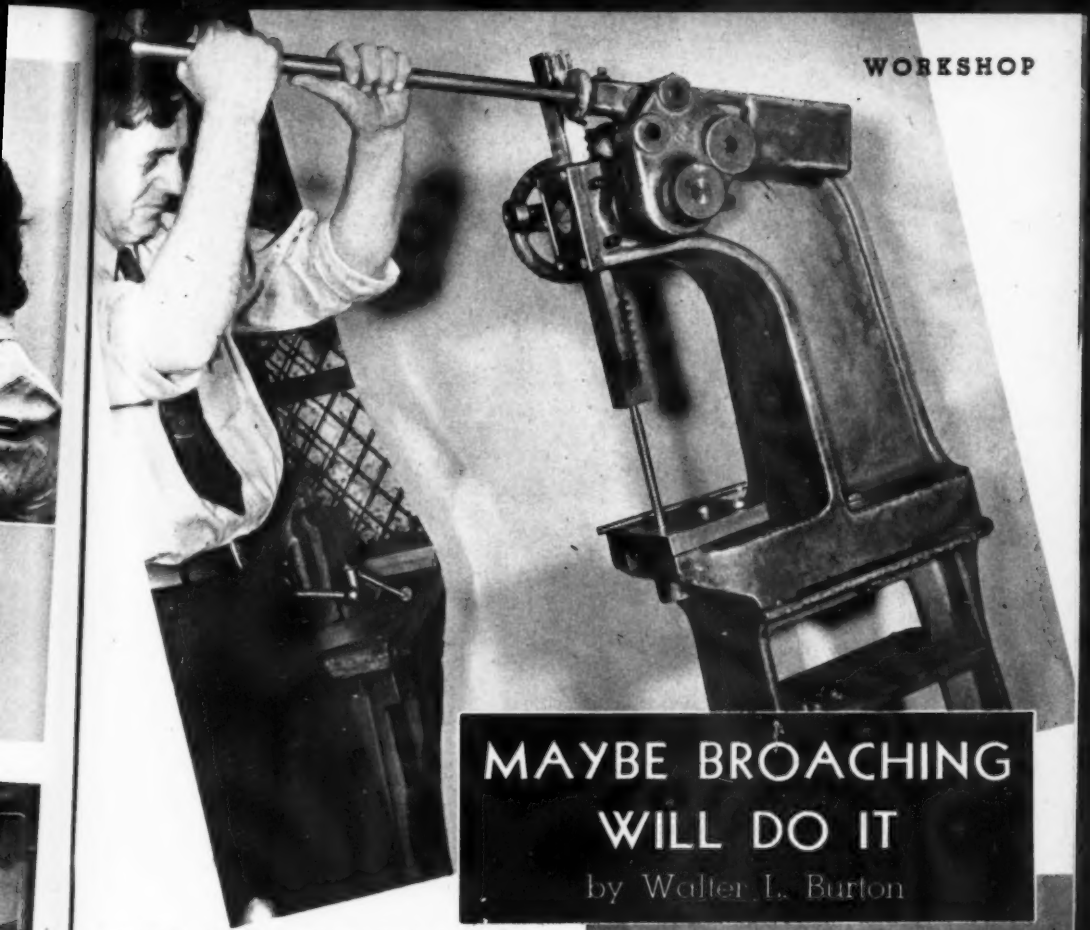


PROJECTION SCREEN *(above)*: A home-made motion picture or still projection screen can be made for no more than $1.50 from an ordinary bed-sheet and a 40x40-inch "stretcher" frame with locking, dovetailed, corner joints—40 cents at artists' supply stores. The sheet is tacked over the frame double thickness and then the corner keys (shown in illustration), spread to hold sheet taut. Beaded screen material could be used same way.—*S. P. McMinn.*



WARNING!

Left: When using G. E. No. 111 enlarging bulb to test reflectors for midget flash on 110-volt line as suggested on page 96 of September MECHANIX ILLUSTRATED, be sure current is "off" when making setup; also, that the bayonet adapter's metal neck is properly insulated. Tape it with two layers of electricians rubber splicing compound covered by ordinary friction tape. Don't use a combined midget flash adapter-reflector unit!



MAYBE BROACHING WILL DO IT

by Walter L. Burton

Above: Five ton Atlas arbor press used as a broaching machine for cutting splines in gear blanks. *Right:* Simple drift-type broach, made from a broken Allen wrench being used to form a hexagon socket in end of a threaded stud.

THE cap, a steel cylinder 2" long with a hole 1½" in diameter and 1¼" deep, had to have a keyway ¼" wide, $\frac{1}{16}$" deep, and ¾" long cut down the inside. But the shop had no shaper, and Herb and Jack couldn't figure a way to do the job on a milling machine.

"I think I can do it," Herb announced, after some deep study.

Jack looked skeptical. "And just how are you going to perform the miracle?"

"Broach."

"Swell! But we have no broaching machine."

"Don't need any. Just watch my chips." And Herb went to work.

Rummaging through the scrap pile, he found a piece of cold-rolled steel 1½" in diameter and about 4" long. It slid freely

The resulting setscrew in use. Wrench is like that used to make the broach. *Below:* Set-up used to cut a difficult blind keyway. Cutter held in plunger.

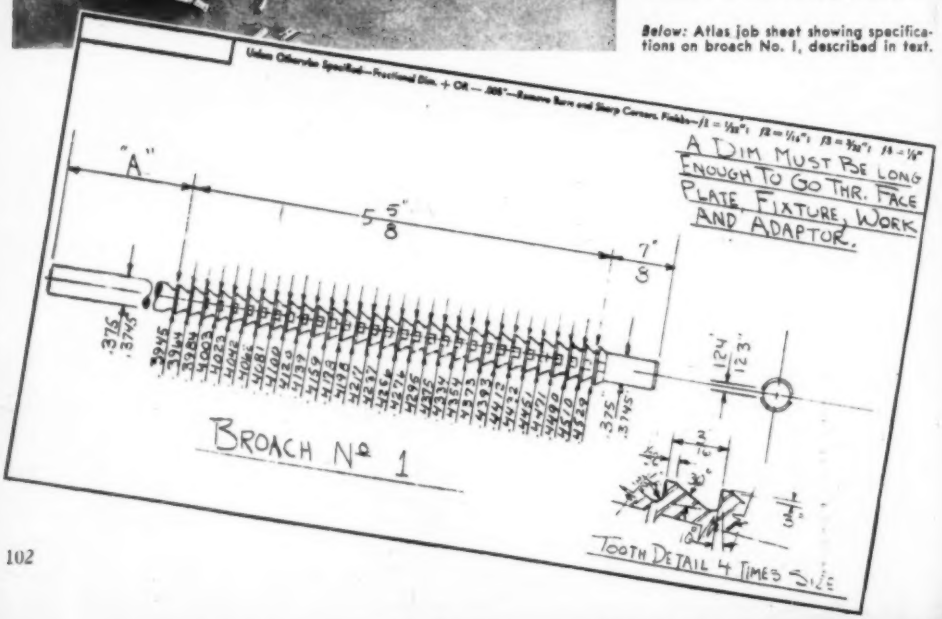
into the hole in the cap. In the center of one end he drilled and tapped a hole ½" deep, to take a ⅜" setscrew. At right angles to this and about $\frac{5}{16}$" from the same end, he drilled a ¼" hole diametrically through the piece. With a 17/64" bit he counterbored one end of this hole and tapped it to receive a $\frac{5}{16}$" setscrew.

"Find me a piece of ¼" high-speed rod about 1¼" long, Jack," Herb said, as he brushed the chips off the tap. "I think there's some, already hardened, in the drawer with the lathe bits."

Herb took the piece of rod, ground one end to a slight bevel, and with a thin, rounded-edge wheel notched it to about half its diameter. The result was a cutting bit that looked a little like a lathe parting tool. This he inserted into the ¼" hole in the piece of shafting, adjusting the cutting edge so it faced toward the nearer end of the piece. Then he inserted the setscrews.

"Looks like a boring bar," Jack observed, "except that the cutter's in the wrong position."

Below: Atlas job sheet showing specifications on broach No. 1, described in text.



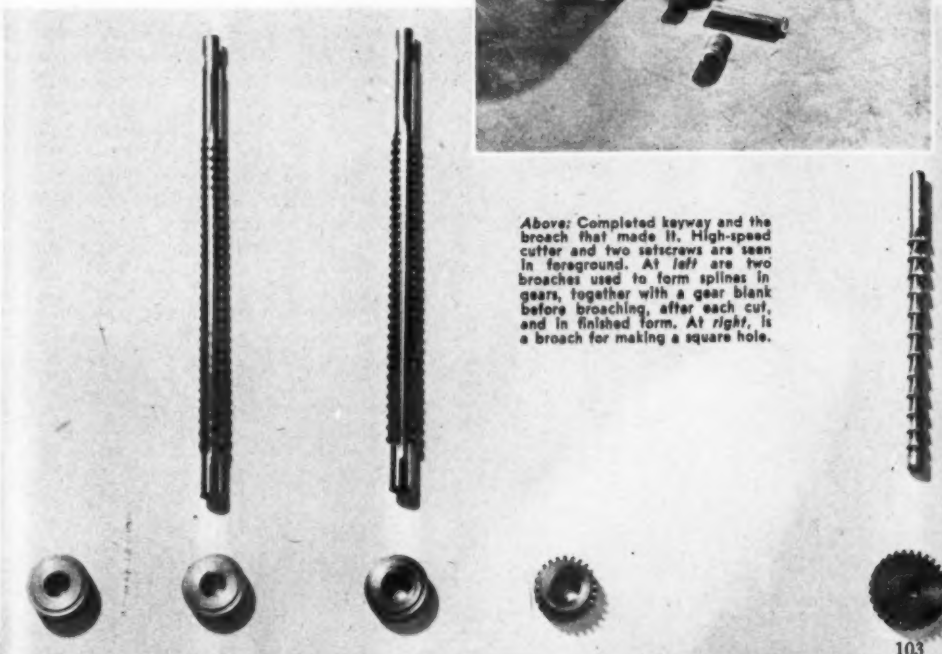
"The construction's practically the same," Herb agreed.

Herb adjusted the cutter until it just barely protruded beyond the surface of its holder, and clamped it there with the 3/8" setscrew. Then he ran the smaller setscrew against the end of the cutter, to prevent slipping. After inserting the end of the broach into the cap hole as far as the cutter would let it go, he opened the jaws of the biggest vise in the shop, held the pieces between them, and by turning the vise screws, forced the broach into the cap as far as it would go. By tapping the cap edge on the edge of the bench, he jarred the broach loose. The cutter had plowed a shallow but clean-cut groove down the side of the cap. However, the chip had jammed tightly against the end of the cutter and stuck there.

"Guess I'll have to dig out a clearance space," Herb said. "Should of thought of it before. Might have busted the cutter."

After making a suitable chip space with the grinder, he set the cutter out about 0.005" and took a second cut. He experimented until he found the best cut depth; and by repeatedly squeezing the broach into the hole and jarring it out, setting out the cutter a few thousandths each time, he soon had the keyway formed. The whole job took a little time; but since it was [*Continued on page* 129]

This shows how the broach was forced into the steel cap by means of a vise. As a precaution, chips were removed frequently.



Above: Completed keyway and the broach that made it. High-speed cutter and two setscrews are seen in foreground. At *left* are two broaches used to form splines in gears, together with a gear blank before broaching, after each cut, and in finished form. At *right*, is a broach for making a square hole.

HOME BAR

Easy and inexpensive to build, this handsome little bar adds life to the party and snap to the room.

by

Ralph Mattison

A BAR adds a festive atmosphere to the basement party room, but it's usually one of the items that just plain costs too much. This one, however, has all the qualities of beauty and convenience that are found in the most expensive home bars, and you can build it for a small fraction of the usual price of one.

Moreover, its compact dimensions make it ideal for the apartment as well as the house. The materials used in the construction are inexpensive—such as the stock size ¾" white pine lumber, or the artificial leather covering. But keep in mind the fact that many a night club bar you've admired was built with the same materials. The artificial leather, for example, is generally used because it is less susceptible to stains than many real leathers. And one more thing that's very important—you can dismantle this little bar with the utmost ease, and transport it anywhere. You'll appreciate that if you decide to move sometime.

The first step in the construction job is the building of the frames for the front and left sides. These are made from ¾" pine planks 4" wide. The front frame includes the 6"

Top and *Bottom* views of bar top. If you lack facilities for making the dovetails, planks may be doweled together instead.

Joining front and side of bar with upholstery temporarily tacked. After fitting, parts are separated for final nailing.

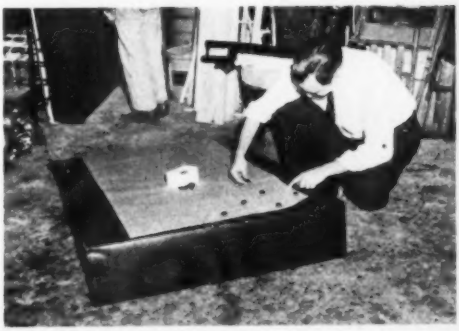
IS INEXPENSIVE TO BUILD

Left: Pretty fancy job, eh? The bartender enters through the other end. That fellow in the middle picture is cutting dovetail groove in bar top plank. *Right:* This way in and out, boys.

wide upright portion of the right side next to the bartender's doorway. The other parts of this side are just the 6″ base board, the 3″ moulding that fits under the bar top, and the rear support—which is made from a 5″ and a 9″ plank joined to form a corner.

When the two frames are completed they are covered with ¼″ plywood, then a layer of upholstery padding. It takes four yards of this to do the job.

The leather is fastened on with upholstery nails. These should be driven in systematically—spaced so as to form a design, as their heads are a part of the bar's ornamentation. The design is first laid out on large sheets of building or wrapping paper, then the paper is laid over the temporarily tacked leather so that the nails can be driven through both—at the points marked for them. Drive them only part way [*Continued on page* 134]



The two photos above show process of laying leather over padding and driving upholstery nails through the paper pattern.

Fitting shelves on 1″x1″ supporting cleats. If you're going to paint them do it before you put them in place. It's easier.

FOUR-PURPOSE

An attractive stand of many uses and simple construction

by
Burl Knutson

Projector and slides are kept in shelves behind front leaf.

This little stand will add to the appearance of any room in which it is placed. Note attractive two-tone stain finish.

THIS neat, trim article of furniture acts as a flower stand, a tilting projection stand, a little work table and a small storage cabinet. A few of your slides and equipment along with the projector may be kept here. It was also constructed so it could be carried about easily. A 12" width of lumber may be used throughout, making for quick and easy construction, though built-up random widths are optional with the craftsman.

Cut the sides, top, and front leaf from 1" lumber of good cabinet quality. If you have no facilities for veneering or inlaying, a simple design can be worked in the front and sides by running a ⅛". deep saw kerf 2" in from the edges. To avoid visible screws or plugged holes, oak or other hardwood cleats are used to hold the shelves and the top. The shelves and back may be made from any material, plywood being excellent. Since the stand will be occasionally removed from the wall, neatness was added to the back piece by setting it in a rabbet.

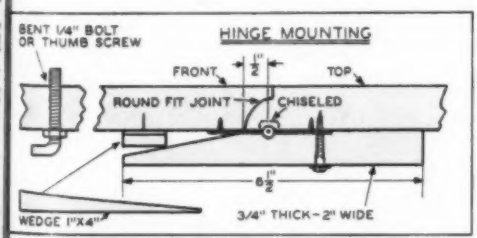
The top and the front leaf are fastened together by means of hinges, which are attached

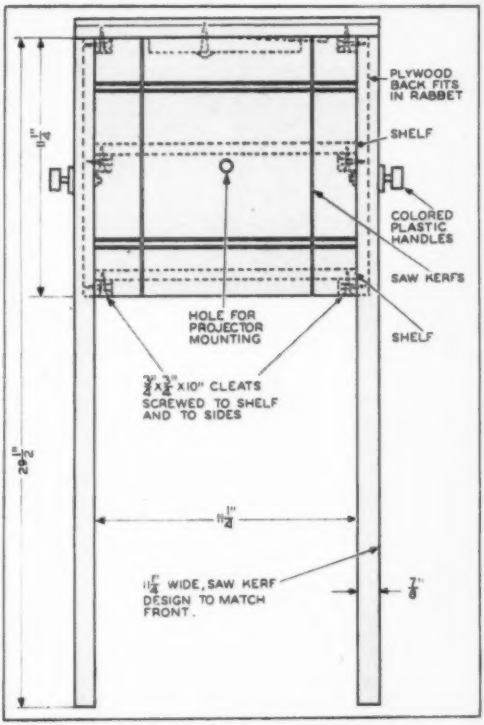
With edges of top and front tightly together hinges are attached. Hinge butts are sunk into grooves chiseled in wood.

PROJECTION TABLE

Left: Handles attached to each side make for easy moving to show your pictures. *Above:* With projector bolted tightly to the tilting top, much steadier pictures may be screened.

as shown in the photo and drawing. Made in this manner, with round connecting edges, the leaf edge will show no gap when down. Many kitchen tables have similar leaves. The locking device is formed from a 6½" x 2" x ¾" piece of oak and pivoted under the top. Notice that it is slightly beveled so the leaf can be held at any small angle for centering pictures on the screen. The wedge nailed under the leaf will assure a tight and substantial little table top when the pivot board is turned tight against it. You will see that a small hole is drilled in the center of the leaf. This is to take a ¼" thumb screw which fits in the regular ¼" threaded hole in the bottom of the projector. This holds the projector in a firm and secure manner. The stand is finished with a two-tone stain effect.





MUSIC NOTES Decorate Wall

A NOVEL wall decoration that is especially appropriate for use near a radio receiver or a piano consists of musical notes cut out of plywood, pressed composition wood, or plastic. Various types of notes and any grouping can be used. The illustrations show a pair of notes cut from plywood; but if desired, a series extending all the way across a wall space, and reproducing some familiar tune, could be made. Each of the notes is provided with a shelf for holding small what-not figures, etc. Of course, the shelves can be omitted if desired.

You can use a piece of sheet music to guide you in laying out the note design. Make each note in the form of an ellipse. Those shown measure 4⅛ in. in length and 2⅞ in. wide. To make an ellipse, drive two pins into a piece of cardboard, spacing them 3 in. apart. Make a loop of string that measures 3½ in. when pulled straight, and place it around the pins. Use this loop to guide a pencil point in tracing the ellipse. Cut the note out of the cardboard and use it as a pattern. The notes are tilted slightly with respect to their stems. Use the elliptical pattern to mark out the shelves, which are notes split in two lengthwise.

Finish the cut-outs with lacquer or enamel of some appropriate color such as black, blue, or red-hot. Plastic usually requires no finish coat.

Above: The cut-out notes are fastened to the wall with two small nails, preferably near a radio or piano. These notes are finished with blue lacquer.

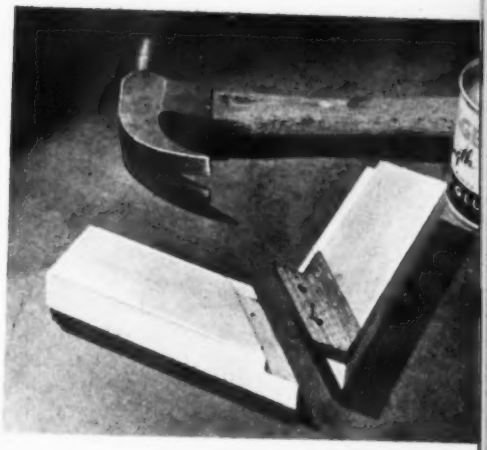
Left: Sawing plywood notes. The pattern is drawn on paper that is fastened temporarily to plywood with rubber cement or paste.

Below: Shelves to hold ornaments are fastened to the notes. Quick-drying pyroxylin cement, plus two small brads, hold each shelf.

Odd Corners for Mitred Frames

by Walter E. Burton

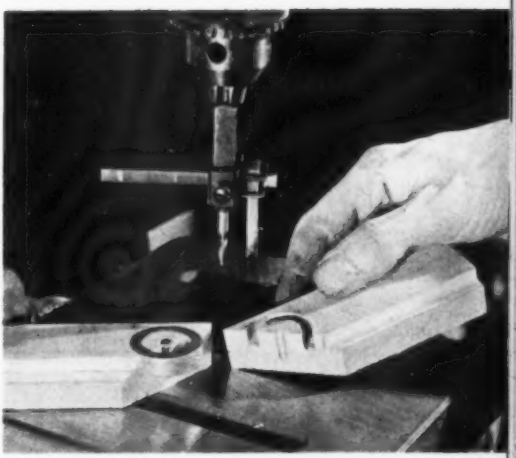
Although arrangement of dowels in above joints does not key parts together, added gluing surface increases strength when dry.



Right: "Arrow Tail" insert reinforces glued mitre by permitting easy nailing. Insert may be of plywood for additional ruggedness.

Use these joint designs to make mitred corners permanently neater and stronger.

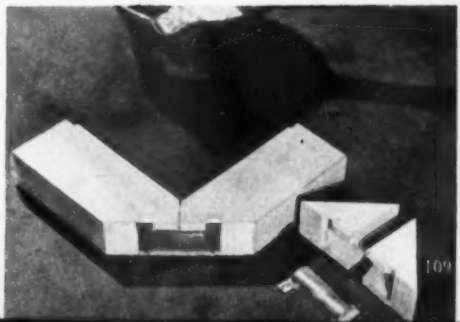
IF YOU ever have tried to do a neat job of putting picture-frame and similar mitred corners together, you know some of the difficulties involved. Mainly such troubles result from slipping of the mitred pieces one way or the other before the glue has a chance to set. The photos and drawings show a number of ways of making secure joints. Some of the methods are fairly well-known to experienced woodworkers, others are novel. Some employ reinforcements that show at edges; others show only on the back or not at all. The primary idea in most cases is not to save time, but to produce a neat, sturdy joint. Always use a jig to hold the parts while the joint is being [*Continued on page* 132]



Poured separately, babbitt ring and pin above add rigidity to corners. Circular cutter shown cuts a recess for cast ring.

"Figure Eight" dowel joint. Side of each dowel is planed flat and glued to the other, then inserted, and entire joint glued.

Below: Another type of lead or babbitt reinforcement, "sliced" to show detail. Lead is poured through small holes into larger.



INLAID

This artistic box will make a fine gift for some lucky lady.

by
Edwin M. Love

White celluloid is the inlay material, and forms a fine contrast with the dark, beautifully grained wood of box.

WHITE celluloid is an excellent material for inlaying. It resembles ivory, but lacks the stubborn hardness and tendency toward splitting, as well as the high cost, of the elephant tusk, and is much easier to glue. Celluloid stock about 3/64" thick was used for decorating the box described here.

Rub both sides of the celluloid with fine sandpaper to give tooth for the pattern and gluing. Draw the pattern on thin paper and rub the back with a pencil for transferring, as a cleaner line is thus obtained than carbon paper affords. Nest the inlays together to save material. Glue the sheet with rubber cement to pressed wood to give a piece thick enough to handle easily and cut it with a stout $\frac{1}{16}$" blade having set teeth. Tilt the table about 15° and saw out the pieces, being care-

After being glued to pressed wood or plywood with rubber cement, inlays are cut. Tilt saw table for a 15° undercut.

Left: Routing for the border band. A nail head, filed square, serves as the cutting tool. Guide may be clamped on table.

ID GLOVE BOX

ful to work from the same direction all around, to preserve the undercut. Skip around the small points, as in the horses' manes, and cut in afterward, all on one side of the angles, tilting the table in the opposite direction to do the other sides.

Cut the top piece oversize and trace the design lightly on it, to locate the inlays. First set in the border bands. No special router is needed; simply file the head of a 4-penny finish nail square and use it in the drill press. Clamp a strip of wood to the table for a fence. Feed the nail in equal to the depth of the celluloid, lock the quill, and push the work along the fence. The slight burr raised is easily sanded off. Cut the bands with tin snips, using a file to correct irregularities. Miter the ends. Fill the grooves with celluloid-base tube glue, waiting for it to get tacky before driving in the bands. [*Continued on page* 137]

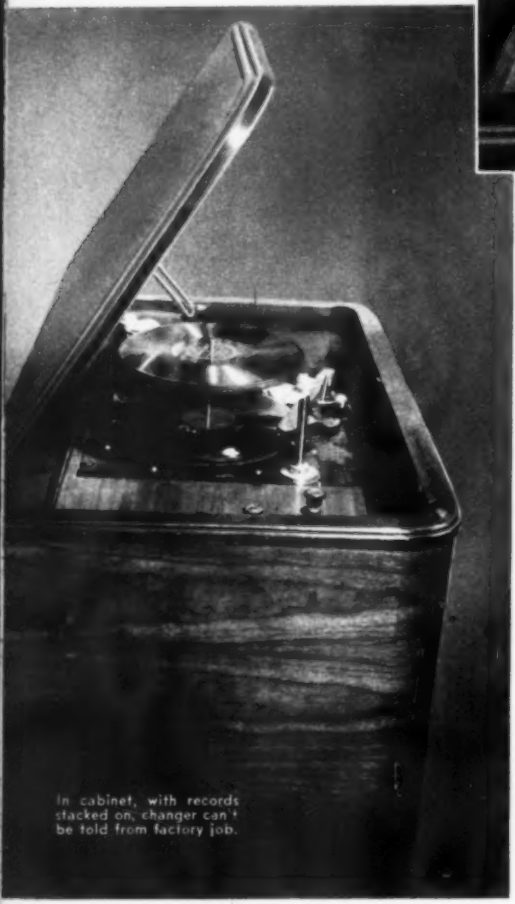
Below: Inlay is tapped on top of wood to create an edge impression for guide in trimming the rough mortise.

Above: Rough-routing an inlay mortise on the drill press.

Automatic

Above: Completed record changer before being mounted in cabinet.

Cabinets like this can be purchased unfinished at low cost from Allied Radio, Chicago, Lafayette Radio, New York City, or mail order house. Radio set is mounted in left half of panel. Note turntable center post extended slightly above height of changer leaves.



In cabinet, with records stacked on, changer can't be told from factory job.

by Raymond Schneider

HERE, presented I believe for the first time to the readers of any mechanical magazine, is a very versatile and easy-to-build *automatic* record changer which does an admirable job equal to, and in some ways superior to, many of the commercial changers on the market today. The parts are few and not difficult to obtain, being on the whole standard electrical equipment still stocked, priority-less, by many radio or electrical supply dealers.

The changer plays either 10″ or 12″ records, the tone arm being adjustable to the record diameter. It will hold twelve or more records at a time, dropping them one-by-one from the stack to the turntable, as it plays them. It is virtually fool-proof and cannot change in the middle of a slightly off-center record, a fault common in many commercial changers of even the more expensive types. Regardless of the length or condition of the music grooves, the changer *must play the record clear through to the end*, for it depends on an electrical contact to start the changing cycle, rather than the usual mechanical "kick-

Record Changer

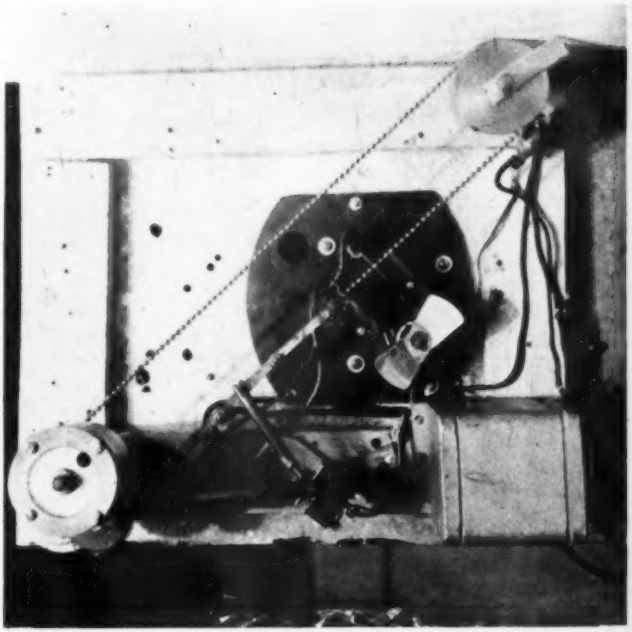
Smooth-working electrical changing unit that will convert your radio into a real radio-phonograph.

back." This type of operation is made possible through the use of two small electric motors, one for turning the turntable, and the other for powering the changing mechanism.

The changer will work through any radio set having the necessary amplifying unit and phonograph connections (most modern superheterodynes are so equipped), and can either be installed directly in the radio cabinet, if space permits, or boxed as a separate unit and wired to the radio. This is up to the builder, so I do not attempt to give any specifications or instructions for cabineting the changer.

The motor that operates the record-changing mechanism can be any reversible type having a speed reducing unit that drops the speed to approximately ten R.P.M. This can vary within fairly large limits. The turntable is the rim drive type which is both compact and inexpensive, although any self-starting type will do. Aside from these two parts and a crystal pick-up which costs very little, all other parts can be made up from odd stock around the shop and ten-cent store parts. As a matter of fact the whole thing, as illustrated, cost me less than $3.50 to build.

[*Continued on page* 138]



Below: Closeup shows pick-up switch and arm or lever that lifts tone arm clear when changing cycle starts. *Right:* Bottom view of mechanism. Note cooling fan on 110-volt A.C. turntable motor. Box at *left top* is transformer to convert house current for 6-volt changer motor (with gears).

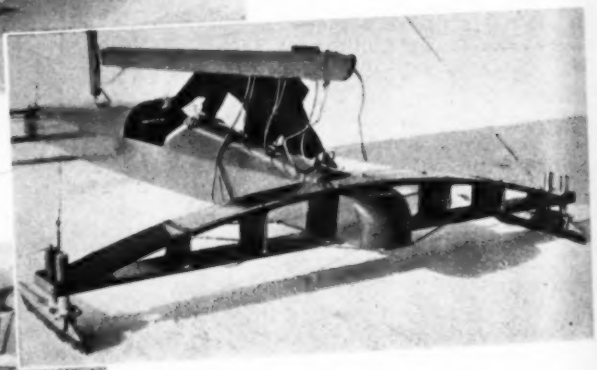
Four-Runner Ice Boat

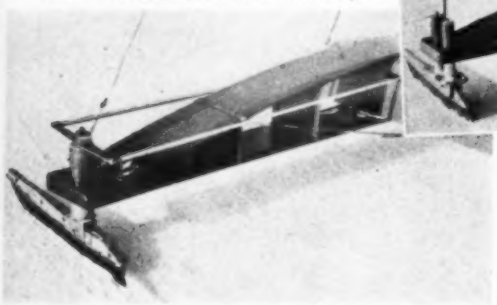
Fast, modern craft of good construction and stability.

by
J. J. Fanta

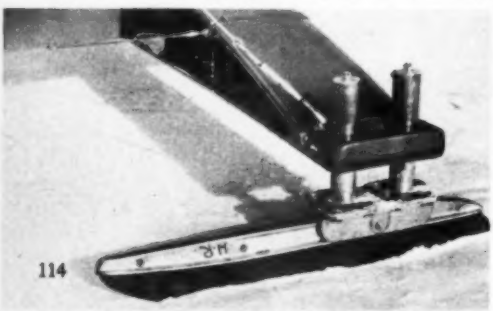
Rigid, truss-beam runner planks are featured in *Quad*. Henry F. Reynolds, of Chicago, designed and built the speedy "boat" above.

Right: Rear view of the streamlined hull, showing construction of runner beams. Each beam is additionally braced with four stays.





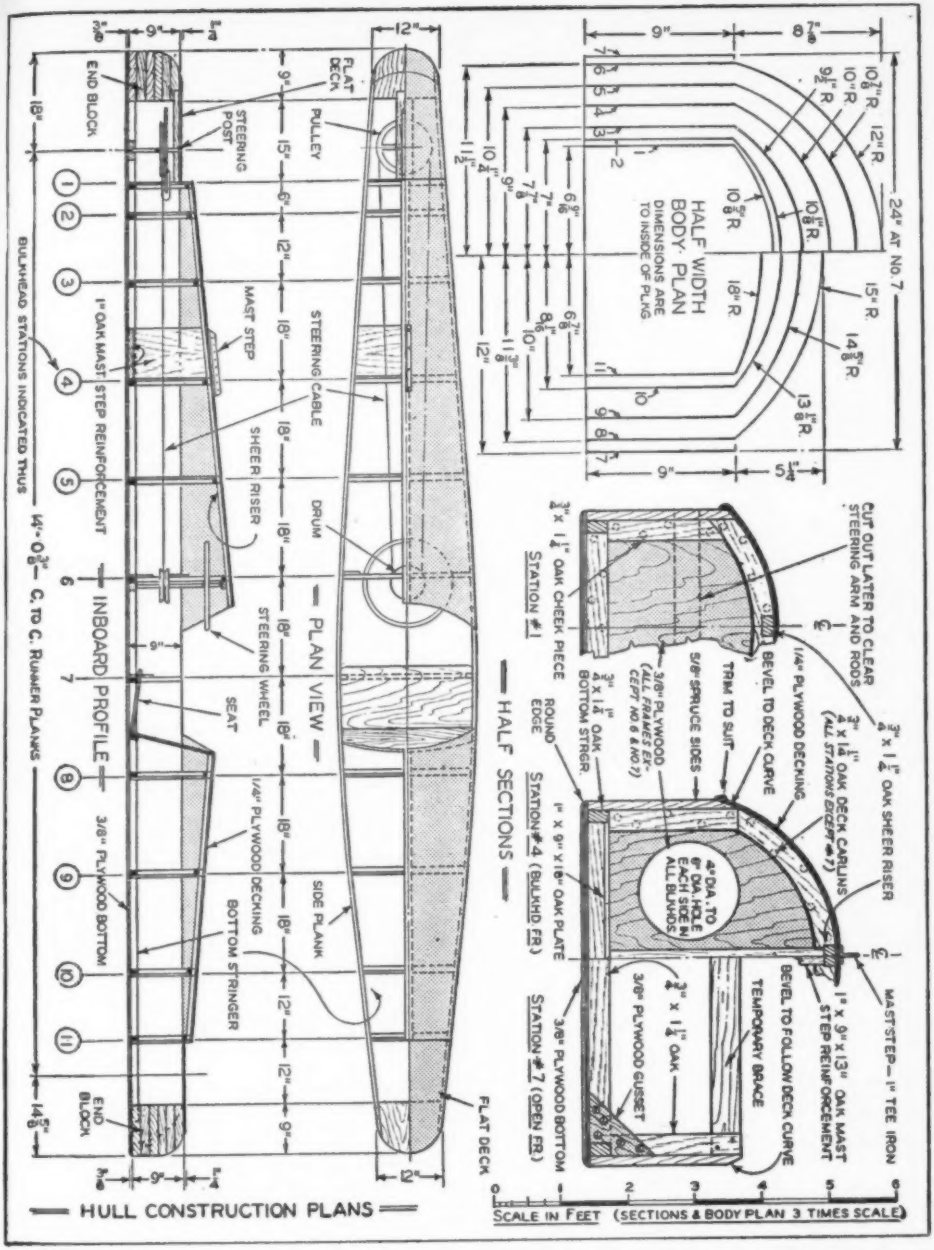
Above: Closeup of steering runner. Note tie rods operating through slots in the hull. *Below:* Runners are individually sprung, with 500 lb. compression springs inside housings.



THOSE whose interest in building a four-runner ice boat has kept apace with constant improvements, will find *Quad* just what they had wanted to build and sail.

Quad is the near-ultimate of its type, with increased efficiency throughout. Although not as tippy as other types, the four-runner craft hikes safely without throwing the design out of balance. The four-cornered hull prevents the sail's tilting forward or backward, when heeling; while hiking is lessened by hull precision.

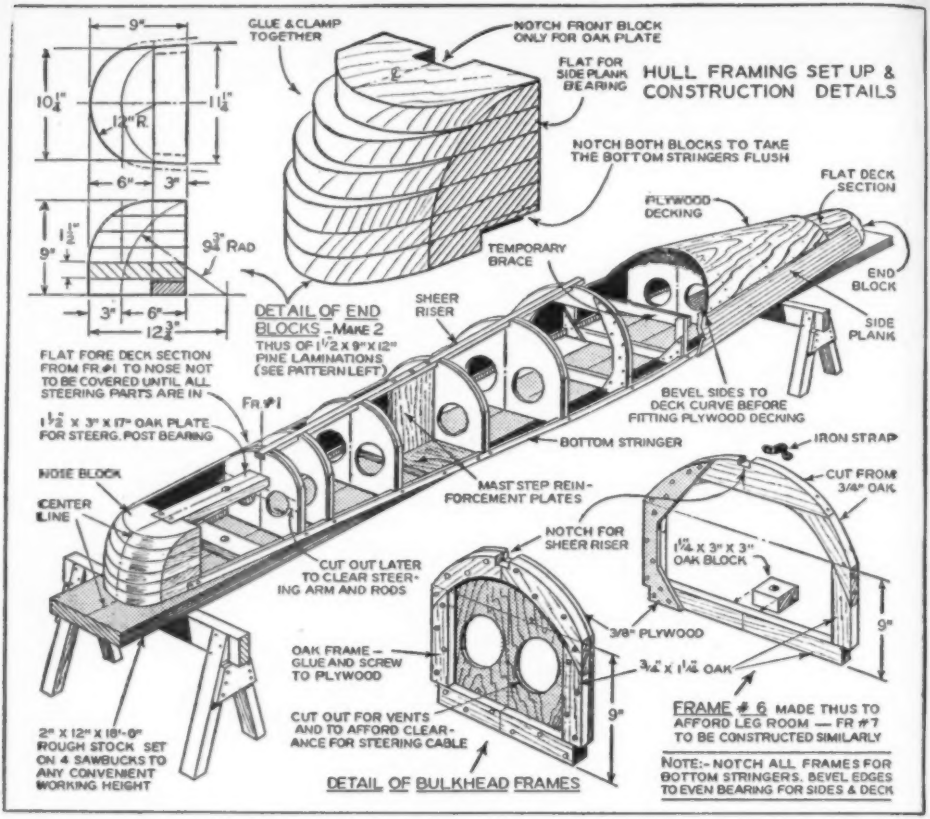
Rigid truss-type runner-beams improve the steering functions of this 16'-9"-foot craft. Whereas resilient, springy runner-planks vary the runner adjustment by flexing, rigid runner beams maintain true steering alignment. Riding comfort is provided by mounting the four runners in


HULL CONSTRUCTION PLANS
PLAN VIEW
INBOARD PROFILE
HALF SECTIONS
HALF WIDTH BODY PLAN
DIMENSIONS ARE TO INSIDE OF PLNG.
24" AT No. 7
END BLOCK
FLAT DECK
PULLEY
STEERING POST
MAST STEP
STEERING CABLE
SHEER RISER
DRUM
STEERING WHEEL
SEAT
1/4" PLYWOOD DECKING
BOTTOM STRINGER
SIDE PLANK
3/8" PLYWOOD BOTTOM
1" OAK MAST STEP REINFORCEMENT
BULKHEAD STATIONS INDICATED THUS
14' 0 3/8" C. TO C. RUNNER PLANKS
CUT OUT LATER TO CLEAR STEERING ARM AND RODS
3/4" x 1 1/4" OAK CHEEK PIECE
STATION #1
3/4" x 1 1/4" OAK BOTTOM STRGR.
ROUND EDGE
3/8" PLYWOOD (ALL FRAMES EXCEPT NO 6 & NO 7)
TRIM TO SUIT
5/8" SPRUCE SIDES
1/4" PLYWOOD DECKING
BEVEL TO DECK CURVE
3/4" x 1 1/4" OAK DECK CARLINS (ALL STATIONS EXCEPT #7)
3/4" x 1 1/4" OAK SHEER RISER
4" DIA. TO 6" DIA. HOLE EACH SIDE IN ALL BLKHDS
1" x 9" x 18" OAK PLATE
STATION #4 (BULKHD FR.)
STATION #7 (OPEN FR.)
3/8" PLYWOOD GUSSET
3/4" x 1 1/4" OAK
TEMPORARY BRACE
BEVEL TO FOLLOW DECK CURVE
1" x 9" x 13" OAK MAST STEP REINFORCEMENT
MAST STEP — 1" TEE IRON
SCALE IN FEET (SECTIONS & BODY PLAN 3 TIMES SCALE)

Here are the essential dimensions for building the hull or backbone which is the main structure of *Quod*. Study plans carefully.

balanced spring-action units. Steering is by remote control with a wheel in the cockpit operating another forward, which is connected to the rudder runners with tie-rods.

Spreading 75 square feet of sail, this is a single-seated craft for racing in Class E or


HULL FRAMING SET UP & CONSTRUCTION DETAILS
GLUE & CLAMP TOGETHER
NOTCH FRONT BLOCK ONLY FOR OAK PLATE
FLAT FOR SIDE PLANK BEARING
NOTCH BOTH BLOCKS TO TAKE THE BOTTOM STRINGERS FLUSH
FLAT DECK SECTION
PLYWOOD DECKING
TEMPORARY BRACE
END BLOCK
SIDE PLANK
SHEER RISER
DETAIL OF END BLOCKS - MAKE 2 THUS OF 1½ X 9" X 12" PINE LAMINATIONS (SEE PATTERN LEFT)
FLAT FORE DECK SECTION FROM FR #1 TO NOSE NOT TO BE COVERED UNTIL ALL STEERING PARTS ARE IN
1½" X 3" X 17" OAK PLATE FOR STEERG. POST BEARING
FR #1
BEVEL SIDES TO DECK CURVE BEFORE FITTING PLYWOOD DECKING
BOTTOM STRINGER
IRON STRAP
NOSE BLOCK
CENTER LINE
MAST STEP REINFORCEMENT PLATES
CUT FROM 3/4" OAK
NOTCH FOR SHEER RISER
1¼" X 3" X 3" OAK BLOCK
CUT OUT LATER TO CLEAR STEERING ARM AND RODS
3/8" PLYWOOD
OAK FRAME - GLUE AND SCREW TO PLYWOOD
¾" X 1¼" OAK
FRAME # 6 MADE THUS TO AFFORD LEG ROOM — FR #7 TO BE CONSTRUCTED SIMILARLY
2" X 12" X 18'-0" ROUGH STOCK SET ON 4 SAWBUCKS TO ANY CONVENIENT WORKING HEIGHT
CUT OUT FOR VENTS AND TO AFFORD CLEARANCE FOR STEERING CABLE
DETAIL OF BULKHEAD FRAMES
NOTE:- NOTCH ALL FRAMES FOR BOTTOM STRINGERS. BEVEL EDGES TO EVEN BEARING FOR SIDES & DECK

Perspective view shows how moulds are set up on a plank resting on horses; hull is gradually built up around them until the whole forms a rigid structure, light in weight. Use waterproof Cascamite glue between the layers of the nose section.

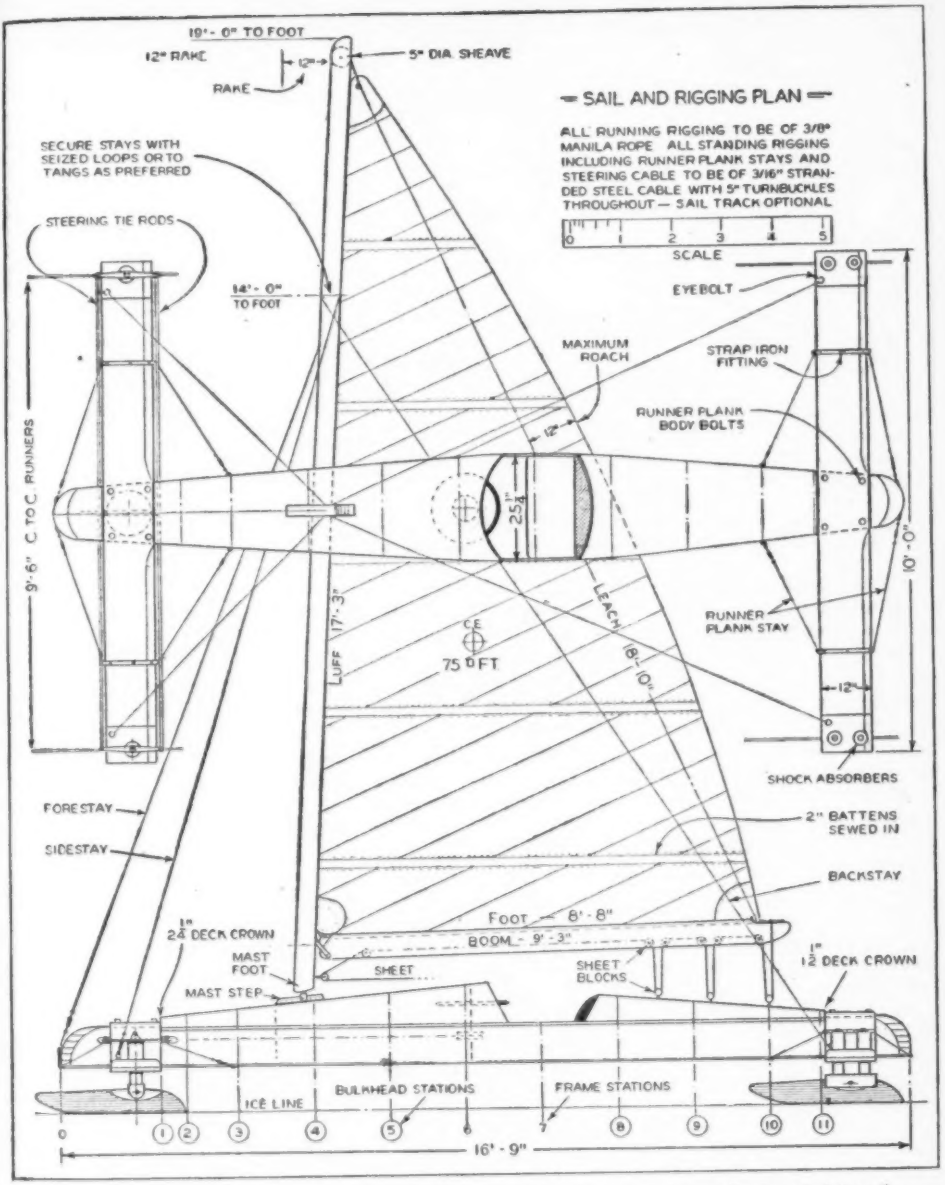
Skeeter events. *Quad* is light and fast, weighing 290 pounds. The deep-bladed runners enable the craft to negotiate light snow almost as well as clear ice.

Before starting to build study the detailed drawings, in particular the hull or body, which is constructed first. As may readily be established by even a cursory glance at the drawings and photos, the body is the main structure in the assembly.

For a precise job nothing can take the place of full size layouts made from the dimensioned drawings given. By doing this rather tedious work you can establish to absolute exactness the precise dimensions of each frame and the required bevels for the frames; this is important inasmuch as it has a direct bearing on the satisfactory lines and workmanship of the finished job. However, for those who are not sufficiently ambitious to lay down full sized lines, the drawings provide working dimensions close enough to establish fair hull lines.

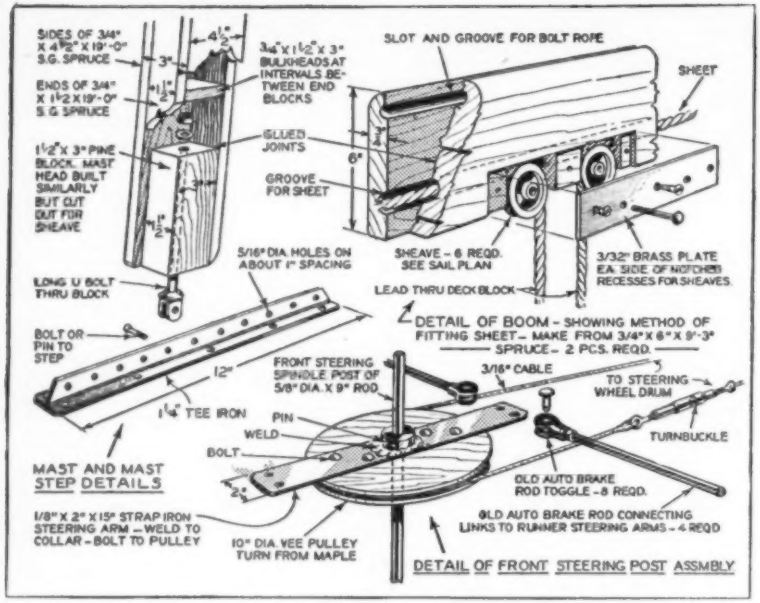
Make the frames first. There are eleven in all and, with the exception of frames Nos. 6 and 7, they are built similarly. All frames excepting Nos. 6 and 7 are in fact bulkheads with a ⅜" plywood base which is reinforced with ¾" oak stock cut about 1¼" wide. The exact size and shape of each frame or bulkhead can be taken off the plans as given (see half width body plans) or, for precision, produced from full size plans made from the scaled down plans shown.

In brief: ten frames carry a deck beam or carlin and one only, the No. 7 frame, is an open frame without corresponding deck beam or carlin. True, the No. 6 frame is also open in that it does not carry a solid web across the width of the hull but it does require a deck carlin. From the plans then, make nine *bulkhead* frames and two open frames. ⅜" plywood and ¾" oak framing are used



Profile view, containing sail plan and top view, showing arrangement of runner plank stays. Use 4 oz. duck for sail.

throughout in making bulkheads and open frames. Notch all frames to take the ¾"x1¼" bottom stringer flush and notch all frames except No. 7 to take the ¾"x1¼" sheer riser (laid flat) also. Actual bevels required by both the contour of the body and by the slope of the deck should be established and put in on the job.


SIDES OF 3/4" X 4 1/2" X 19'-0" S.G. SPRUCE
ENDS OF 3/4" X 1 1/2 X 19'-0" S.G SPRUCE
1 1/2" X 3" PINE BLOCK. MAST HEAD BUILT SIMILARLY BUT CUT OUT FOR SHEAVE
LONG U BOLT THRU BLOCK
BOLT OR PIN TO STEP
12"
1 1/4" TEE IRON
MAST AND MAST STEP DETAILS
3/4" X 1 1/2" X 3" BULKHEADS AT INTERVALS BETWEEN END BLOCKS
GLUED JOINTS
GROOVE FOR SHEET
SLOT AND GROOVE FOR BOLT ROPE
SHEET
6"
5/16" DIA. HOLES ON ABOUT 1" SPACING
SHEAVE - 6 REQD. SEE SAIL PLAN
3/32" BRASS PLATE EA. SIDE OF NOTCHED RECESSES FOR SHEAVES
LEAD THRU DECK BLOCK
DETAIL OF BOOM - SHOWING METHOD OF FITTING SHEET - MAKE FROM 3/4" X 6" X 9'-3" SPRUCE - 2 PCS. REQD.
FRONT STEERING SPINDLE POST OF 5/8" DIA. X 9" ROD
3/16" CABLE
TO STEERING WHEEL DRUM
PIN
WELD
BOLT
TURNBUCKLE
2"
OLD AUTO BRAKE ROD TOGGLE - 8 REQD.
1/8" X 2" X 15" STRAP IRON STEERING ARM - WELD TO COLLAR - BOLT TO PULLEY
10" DIA. VEE PULLEY TURN FROM MAPLE
OLD AUTO BRAKE ROD CONNECTING LINKS TO RUNNER STEERING ARMS - 4 REQD
DETAIL OF FRONT STEERING POST ASSMBLY

Hollow mast is built to accepted standards. Solid pine or spruce ends are used and bulkheads, in this case ¾" x 1½" x 3", spaced throughout the length, particularly at any point of severe stress such as stay termination points. Mast may be equipped with either a groove for sail bolt rope or standard Marconi track. Enclosed sheet leads shown may be eliminated, if desired, and sheet lead outside through sheaves. Original craft had enclosed sheets, and it makes for a beautifully neat finish.

All bulkheads should be cut out to afford vent holes and in order to allow free passage for the steering cables which run from the steering post drum forward to the steering post pulley. The actual size of these holes is unimportant. Bulkhead frame No. 1 will later have to be cut out further in order to allow free play for the steering arm attached to the forward steering post pulley and for the tie rods which extend to the steering arms situated immediately above the forward or steering runners. Use a ⅜" drill and a keyhole saw in making these cuts and carry them clear through the side planks. This cutting is done later however, and only after the hull is completed and the runner, planks, runners and steering hook-up have been carefully studied.

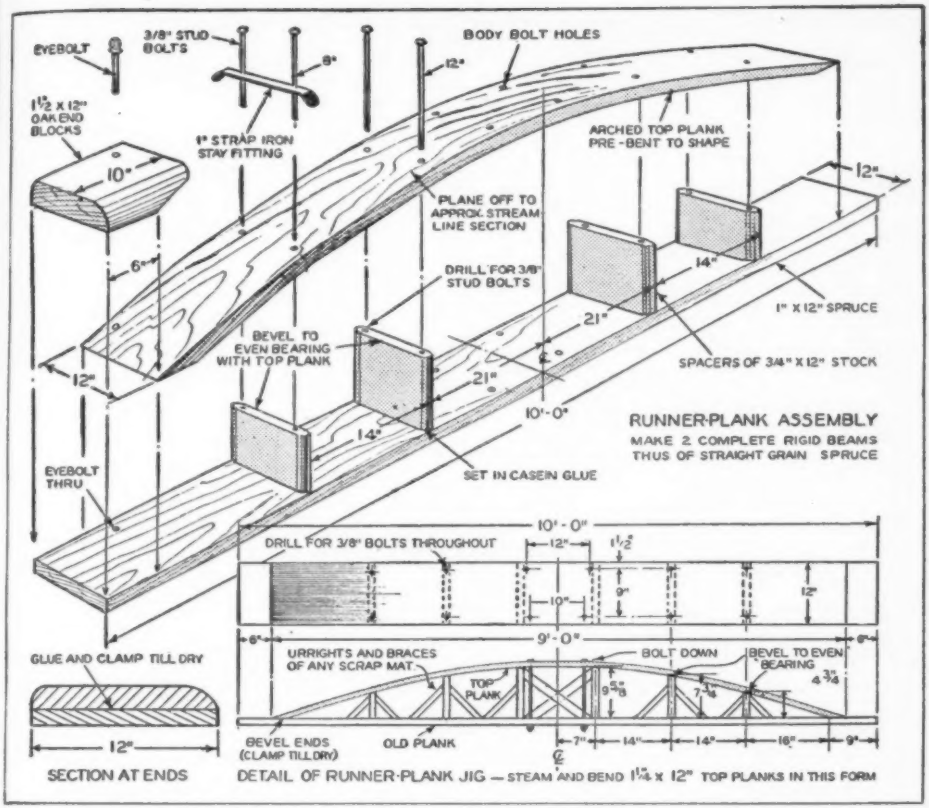
After making the bulkheads and open frames the end pieces may be constructed. Both end pieces are identical in shape and construction. They are simply made by sawing out six laminations of 1½"x9"x12" pine to the required shape and gluing the laminations together with casein glue. Allow the clamped blocks to dry at least 24 hours before taking off the clamps.

Both end blocks should be notched to receive the bottom stringers and the nose block should be additionally notched to receive the front steering post bearing plate as shown in the detail drawings. These notches are more easily put in before gluing the end block laminations together. Thus: The notches for the bottom stringers are cut into the bottom lamination of nose and stern block—the notch for the steering post bearing plate is cut into the top lamination of the front, or nose block lamination only. Actually the drawings show this more clearly than is easily explained.

Now for the assembly or set up. As shown in the construction drawings, a heavy wide plank of any rough stock will suffice, is laid on a few sawbucks at convenient working height and the plank laid out carefully with centerline and station lines to correspond with the dimensions given in the plans. Set up the various bulkheads, frames and end blocks in their appropriate positions and nail them to the baseboard after ensuring that alignment is exact.

Bend in the ¾"x1¼" bottom stringers and put in the sheer risers of similar size but laid flat. Now the side planks can be bent to even bearing around the framing. Mark off the required bevels; cut and then secure the side planks. These are best of ⅝" spruce but any satisfactory stock may be substituted. Secure the side planks to all frame stations with brass woodscrews, and then bevel the upper edges to conform to the deck beam curve at each given station.

Put in the upper decking from bulkhead No. 1 to No. 6, or just aft as the drawings show,


EYEBOLT
3/8" STUD BOLTS
BODY BOLT HOLES
1½ X 12" OAK END BLOCKS
1" STRAP IRON STAY FITTING
ARCHED TOP PLANK PRE-BENT TO SHAPE
PLANE OFF TO APPROX. STREAM LINE SECTION
DRILL FOR 3/8" STUD BOLTS
BEVEL TO EVEN BEARING WITH TOP PLANK
1" X 12" SPRUCE
SPACERS OF 3/4" X 12" STOCK
RUNNER-PLANK ASSEMBLY
MAKE 2 COMPLETE RIGID BEAMS THUS OF STRAIGHT GRAIN SPRUCE
SET IN CASEIN GLUE
EYEBOLT THRU
DRILL FOR 3/8" BOLTS THROUGHOUT
GLUE AND CLAMP TILL DRY
URRIGHTS AND BRACES OF ANY SCRAP MAT
BOLT DOWN
BEVEL TO EVEN BEARING
TOP PLANK
BEVEL ENDS (CLAMP TILL DRY)
OLD PLANK
SECTION AT ENDS
DETAIL OF RUNNER-PLANK JIG — STEAM AND BEND 1¾ x 12" TOP PLANKS IN THIS FORM

Two sets of runner beams are built up exactly as *above*, and identical in nature. Straight-grained spruce is preferable for all pieces except the end blocks which must be of oak or other hard wood. No details are given for the drilling required to take the upper spring housing tubes since this will depend on actual outside diameter of tubes employed.

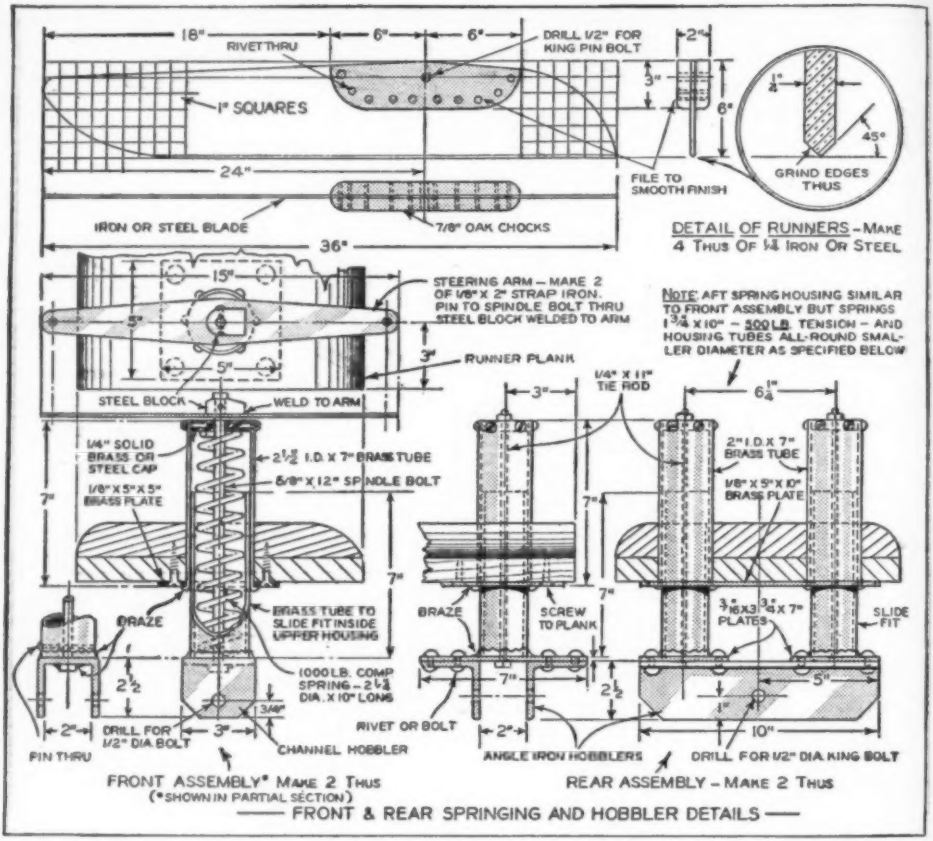
and then secure the aft decking in similar manner. It will be noted that the *curved* decking comes to an abrupt end at stations No. 1 and (apart from the cockpit cutout) No. 11. Lay the flat portion aft of No. 11 with ¼" plywood same as the curved decking but leave the front flat decking space open at this time. It is imperative that the steering components be installed before the fore flat deck is laid.

Now, with all decking laid except the fore deck just referred to, the hull can be removed from the form and turned over for attention to the bottom. The bottom should be of ⅜" plywood and is laid from stem to stern. Before putting in the bottom it is a good plan to install the mast step reinforcements. The drawings show these parts clearly. The sheer riser is strengthened by the addition of a vertical oak plate which rests or bears on a similar oak plate, which in turn is screwed to the sides through the bottom stringers.

The bottom is covered with plywood cut to fit flush with the sides and is screw-fastened to them. Seat frames may be built in now to hold the cushion desired. The steering wheel may be put in now or later, horizontally.

The runner beams come next. They are similar in size and construction throughout, measuring 10′ long and 12″ wide. The best straight-grained spruce available should be used. Bottom pieces of both runner beams are straight. The 9⅝″ crowns of both top pieces should be accomplished simultaneously by bending them over an easily made form, to insure the same curvature.

The mould is made by cutting uprights of various heights of old lumber. Evenly spaced, the uprights are nailed to an old plank and



Runners of ¼" steel or iron may be used as above. They are shouldered with ⅞" oak chocks riveted through, with rivets filed down to afford to flat, smooth working surface to ride in the hobblers. If desired, 2" oak runner chocks with inlet steel blades may be substituted, but overall dimensions will remain the same.

are solidly braced. Bend a batten over the tops of the uprights to get the necessary bevel of the tops, and trim off accordingly. These bevels allow the planks, when bent, to bear evenly. Check the curvature with the temporary batten, making certain that the symmetry is perfect.

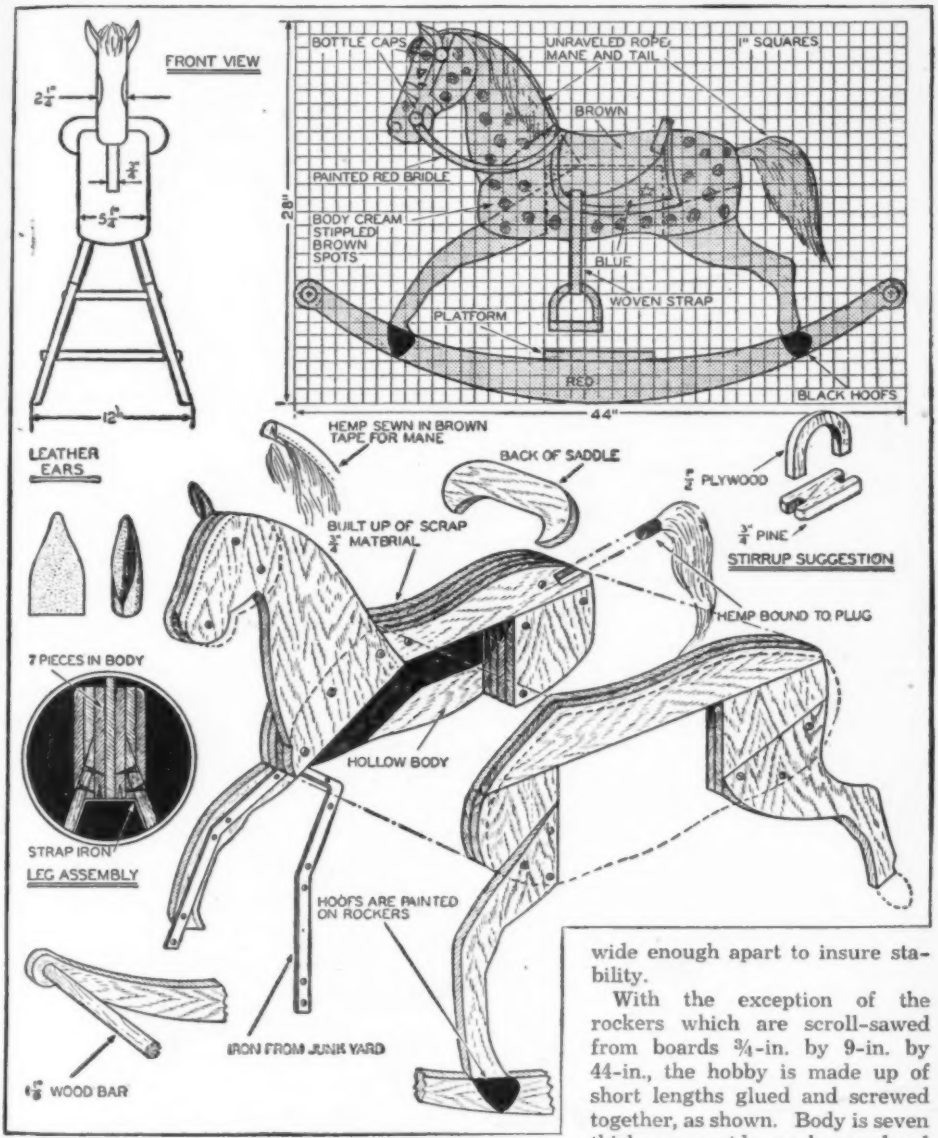
The top boards of 1¼" oak may be steamed or thoroughly soaked with steaming hot water, before placing them over the form. Weigh the ends down, or better yet, clamp them to the form's plank with C-clamps. Even after the planks are on the form, soak them additionally, if necessary. Allow the boards to dry at least 48 hours before removing the clamps or weights.

Ends of the top curved beams are beveled so that when the end blocks, which are also beveled to fit, are on, a locking joint is formed, securing the ends. The end blocks are 1½" thick and 12" wide, beveled and planed for a snug fit to the crowned beams. These end blocks are casein glued, and C-clamped until glue is dry. Outer ends are cut flush with the corners rounded for neat appearance.

In the curve of the runner beams, evenly spaced uprights, fitting snugly, are secured with long ⅜" bolts or studs. Each runner beam is fitted over the ends of the body and secured with 13" bolts. It is additionally braced with $\frac{3}{16}$" wire stays tightened with small turnbuckles. (The forward runner beam is put on after the steering gear.)

It should be noted that the shock-absorbing spring housing fit into holes carefully drilled at the outer ends [*Continued on page 158*]

THE HORSE COMES BACK



SURE enough the horse is coming back, not only in the garage—pardon me, I mean stable—but in the nursery as well, and here is a model like your grandfather used to ride, when hobbies looked like horses and not mere painted silhouettes. This one is built up to have some form to its body, and legs that are wide enough apart to insure stability.

With the exception of the rockers which are scroll-sawed from boards ¾-in. by 9-in. by 44-in., the hobby is made up of short lengths glued and screwed together, as shown. Body is seven thicknesses wide, neck one, head three, legs one, reinforced with any strap iron available in the junk yard. Edges and corners of head and body are rounded with draw shave. With a wood back to a painted saddle, a very comfortable seat is achieved. Stirrup straps should be adjusted to suit the rider. Upper ends of legs [*Continued on page* 156]

THE FIRST

by Herbert Lozier

YOU model makers who wish to build something out of the ordinary will find this model of a 1905 Ford car a different and completely interesting subject. Take a good look at the photograph, see the detail and striking appearance of this model. Notice, too, after you have consulted the plans, that you will find it an extremely simple car to make, whether you use cardboard or metal.

As for the car itself, it is as close to the

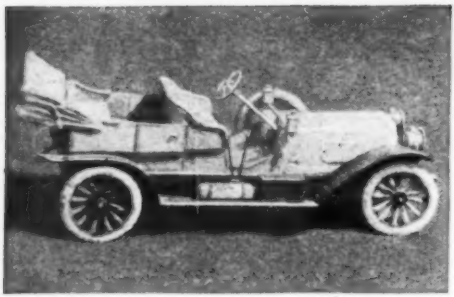
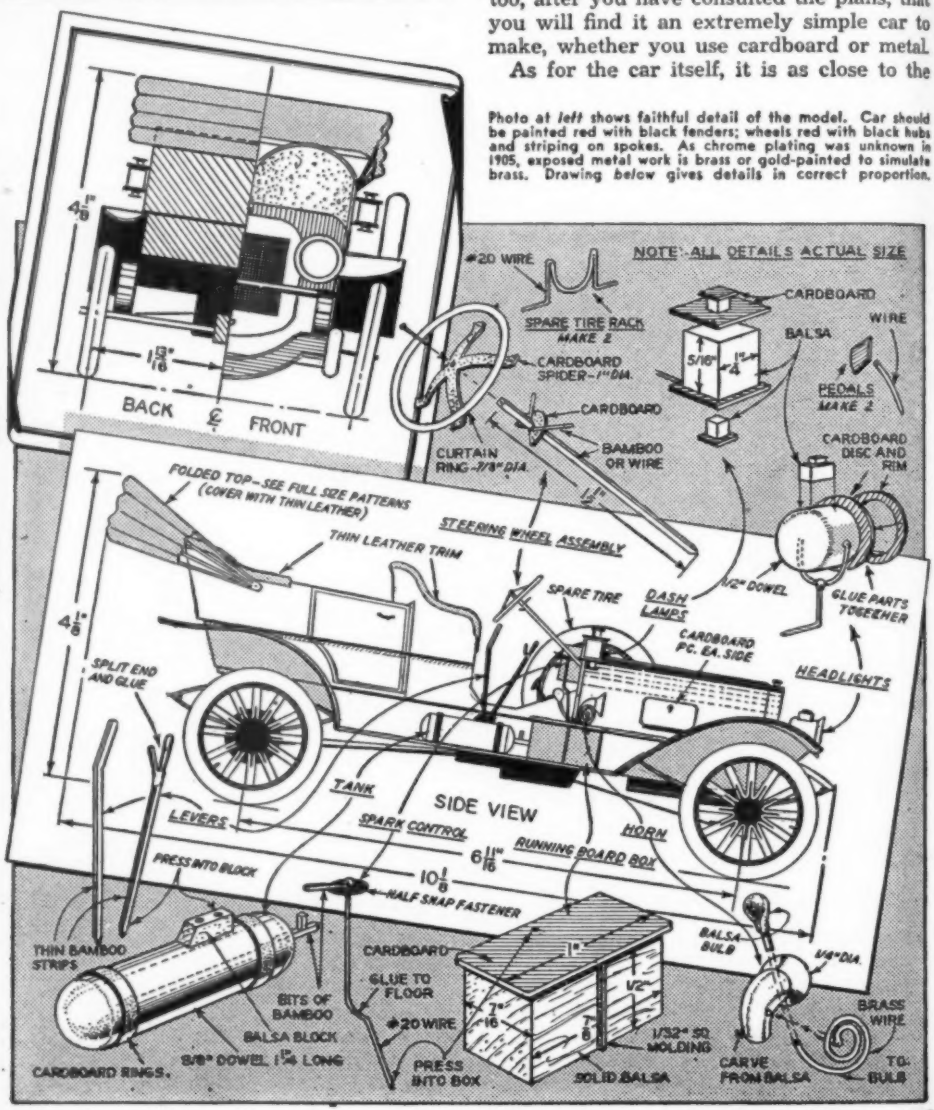


Photo at *left* shows faithful detail of the model. Car should be painted red with black fenders; wheels red with black hubs and striping on spokes. As chrome plating was unknown in 1905, exposed metal work is brass or gold-painted to simulate brass. Drawing *below* gives details in correct proportion.

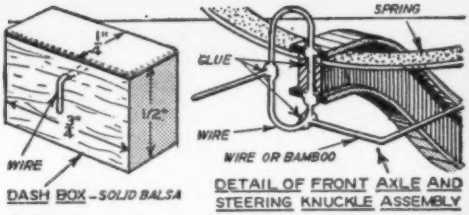


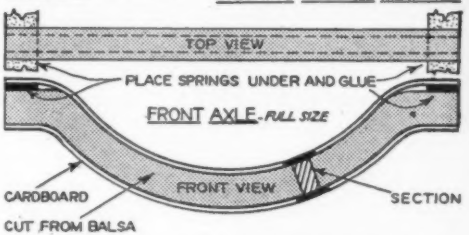
JALOPPY

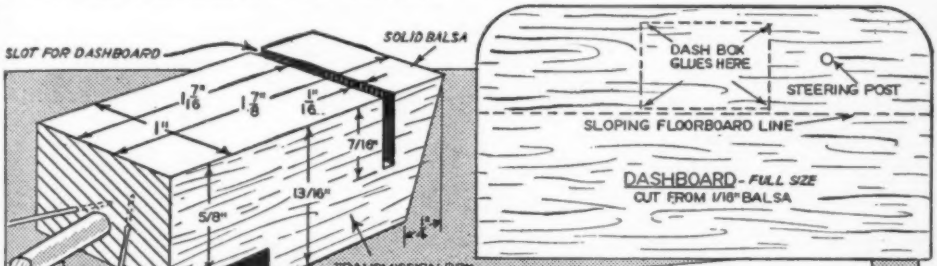
A model of the six cylinder Ford Model "K" 1905 touring car.

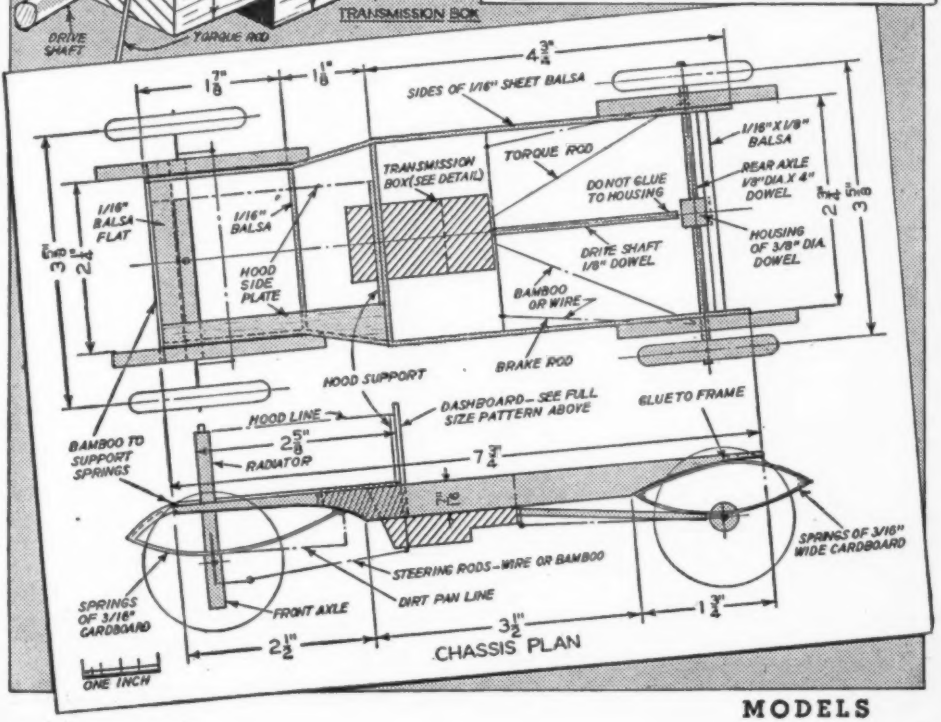
original as the author could make it from the information he had available, which was fairly complete. The model is built to an approximate scale of ¾" to 1 foot, and for the sake of simplicity few measurements will be given in the text. All the necessary specifications will be found on the plans.

Now just a word before you begin: remember to have the grain of the cardboard run the way you wish to fold any piece, or it will crack, and always make your parts





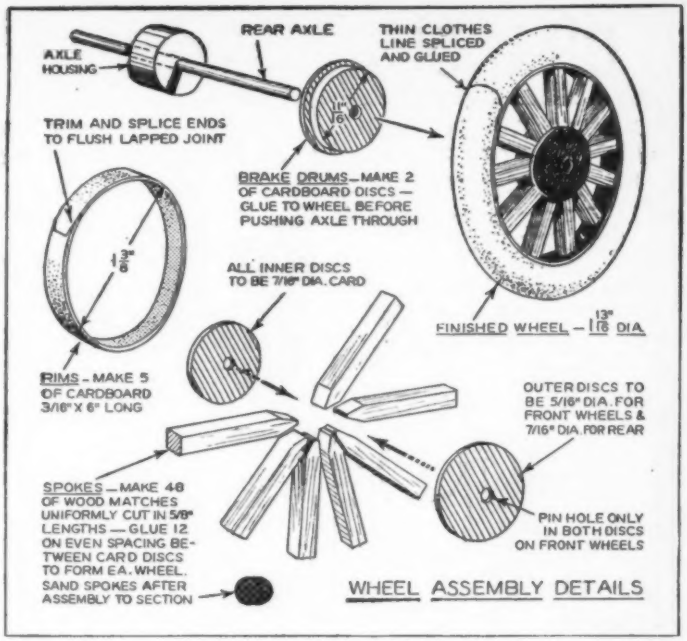




.109" DIA DOWEL
CHASSIS TOP LINE
RADIATOR SHELL — CUT FROM 3/16" BALSA
CENTER LINE
BEND TO SAME CURVE AS FOLDED TOP PATTERN
CUT OUT
HALF WIDTH FULL SIZE PATTERN FOR SIDE AND BACK OF FRONT SEATS
CENTER LINE
CUT OUT
CUT ONE CENTER ARM REST THRU
BEND UNDER
BODY BACK PIECE GLUES HERE
HALF WIDTH FULL SIZE PATTERN FOR SIDE AND BACK OF REAR SEAT
BEND UNDER
STRIPE TO OUTLINE DOORS
WIRE HANDLE
GLUE TO CARDBOARD
FOLDED TOP MAKE 2 SIDE PIECES THUS (L & R)
BAMBOO
FRONT FENDERS - MAKE 2
GLUE TOGETHER ALONG THIS EDGE
BACK PLATE FOR FRONT FENDERS — MAKE 2
APPROXIMATE CHASSIS LINE
TOP PIECE TO THIS LINE
BOTTOM PIECE TO THIS LINE
FOLDED TOP PATTERN
HALF WIDTH, FULL SIZE — MAKE 1 TOP AND 1 BOTTOM
GLUE TO DASHBOARD
STARTER BUTTON
CLUTCH & BRAKE PEDALS
FOOT THROTTLE
FRONT FLOOR BOARDS "BEND UP ON BROKEN LINES"
FRONT EDGE OF SEAT
HOOD SIDE PLATES - MAKE 2
REAR FENDER - MAKE 2
These patterns are exact size; cut them out a bit full and paste to cardboard, then trim to line. Cardboard may be used either for actual building of model or as templates if you intend working in metal. Dotted lines, of course, indicate bends or parts positions.

(body, etc.) a bit larger than the given full-sized patterns. This will allow you plenty of room to trim and set the final product. Before you glue make sure that all parts fit accurately. If you use metal, work the same way but solder instead of gluing.

The chassis is built up of balsa or pine $\frac{1}{16}$" thick. There are 3 cross members and two side members, which are cut to shape first. They are bent as shown on the top view of the plan. Then the cross members are cut to length and width and glued in position between the sides. Notice that the front and rear cross pieces lie flat. Keep the chassis weighted down until it is dry, so that it does not twist out of shape. Across the front of the chassis, and glued to the flat forward member is a length of wire or bamboo. This holds the springs to the front of the frame. (See the plan.)


AXLE HOUSING
REAR AXLE
THIN CLOTHES LINE SPLICED AND GLUED
TRIM AND SPLICE ENDS TO FLUSH LAPPED JOINT
BRAKE DRUMS—MAKE 2 OF CARDBOARD DISCS — GLUE TO WHEEL BEFORE PUSHING AXLE THROUGH
ALL INNER DISCS TO BE 7/16" DIA. CARD
FINISHED WHEEL — 13/16" DIA.
RIMS - MAKE 5 OF CARDBOARD 3/16" X 6" LONG
OUTER DISCS TO BE 5/16" DIA. FOR FRONT WHEELS & 7/16" DIA. FOR REAR
SPOKES—MAKE 48 OF WOOD MATCHES UNIFORMLY CUT IN 5/8" LENGTHS — GLUE 12 ON EVEN SPACING BETWEEN CARD DISCS TO FORM EA. WHEEL. SAND SPOKES AFTER ASSEMBLY TO SECTION
PIN HOLE ONLY IN BOTH DISCS ON FRONT WHEELS
WHEEL ASSEMBLY DETAILS

Care should be taken in preparation of the wheels, as they are a major factor in lending the model a realistic appearance. Rubber tires are unnecessary—cord serves every bit as well.

The dash is cut out of a piece of balsa $\frac{1}{16}$" thick, or heavy cardboard. The position of the switch box and place for the steering rod is marked on the pattern. It is a good idea to drill the $\frac{1}{16}$" diameter hole for the steering rod before the dash is glued between the chassis side members.

Just behind the front flat cross piece is the radiator. It is cut from wood $\frac{3}{16}$" thick, and sandpapered smooth. If you wish you may recess the square in the center and fill it in with screen to represent the radiator core. Or you may leave it smooth and paint it black. The filler cap is a bit of $\frac{1}{16}$" dowel glued in place. When the radiator is complete paint it brass (gold) and the chassis black. Notice that there is an extra piece cut to same shape as the radiator that goes in front of the dash. It helps keep the back of the hood in place.

The radiator goes into position first. Make certain that it is mounted correctly in the chassis, the top being about $\frac{1}{16}$" above the top of the side member of the chassis. If you haven't put the dash in place, do it now, and notice that it goes to the very bottom of the frame. Glue the hood support to the front of it, making sure that it is in the correct place, for if it isn't the hood will slope and become out of line.

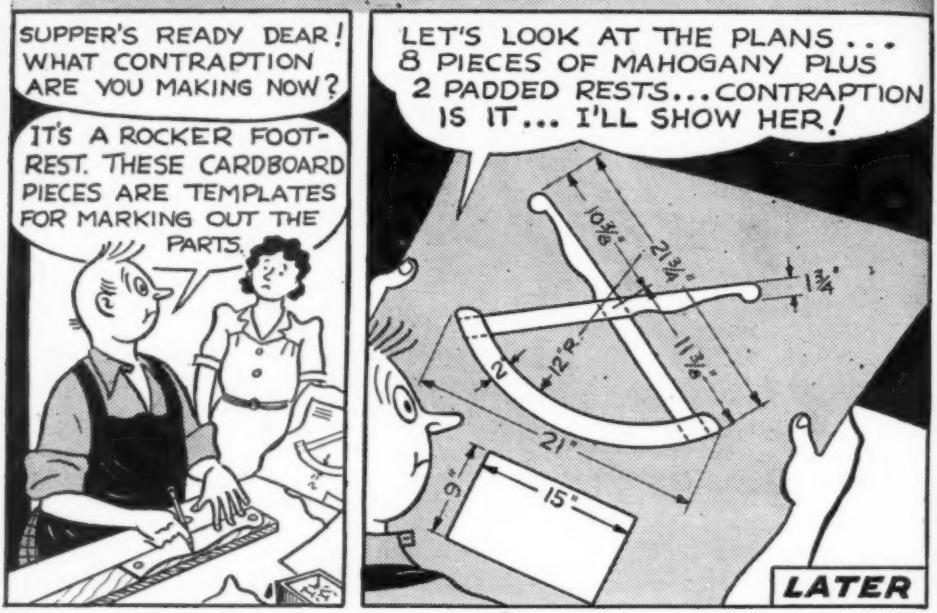
The hood is a piece of cardboard 3¾" wide by 2⅝" long. Trim it down until it fits correctly and hold it in place with small pins until it is dry.

The transmission box is a solid block of wood cut to shape, and grooved so that it fits over the lower edge of the dash. After it is sandpapered and glued in place, a ⅛" diameter dowel is inserted into the rear to act as the drive shaft. Make sure that there is at least a $\frac{1}{16}$" clearance between the end of this shaft and the dummy rear end housing.

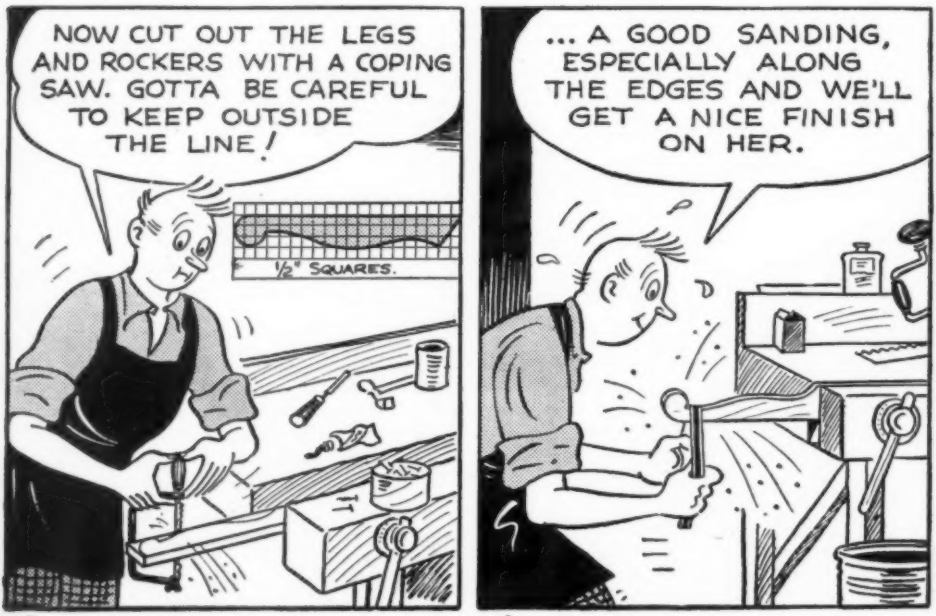
The two front springs are made of $\frac{3}{16}$" wide cardboard about 3¾" long. These strips are carefully cut out and bent to the shape shown on the plan. You may have one, two, or three leaves in each spring. The front ends are attached to the bamboo cross piece, and the rear to the side of the chassis. Glue these ends securely and hold with pins until dry.

The rear springs [*Continued on page* 162]

BILL BUILDIT *makes himself a*


SUPPER'S READY DEAR! WHAT CONTRAPTION ARE YOU MAKING NOW?
IT'S A ROCKER FOOT-REST. THESE CARDBOARD PIECES ARE TEMPLATES FOR MARKING OUT THE PARTS.
LET'S LOOK AT THE PLANS... 8 PIECES OF MAHOGANY PLUS 2 PADDED RESTS... CONTRAPTION IS IT... I'LL SHOW HER!
10 3/16"
21 3/4"
1 3/4"
2"
12" R.
11 3/16"
21"
9"
15"
LATER

1. 2.


NOW CUT OUT THE LEGS AND ROCKERS WITH A COPING SAW. GOTTA BE CAREFUL TO KEEP OUTSIDE THE LINE!
1/2" SQUARES.
... A GOOD SANDING, ESPECIALLY ALONG THE EDGES AND WE'LL GET A NICE FINISH ON HER.

3. 4.

Solid Comfort Rocker Footrest

5.

6.

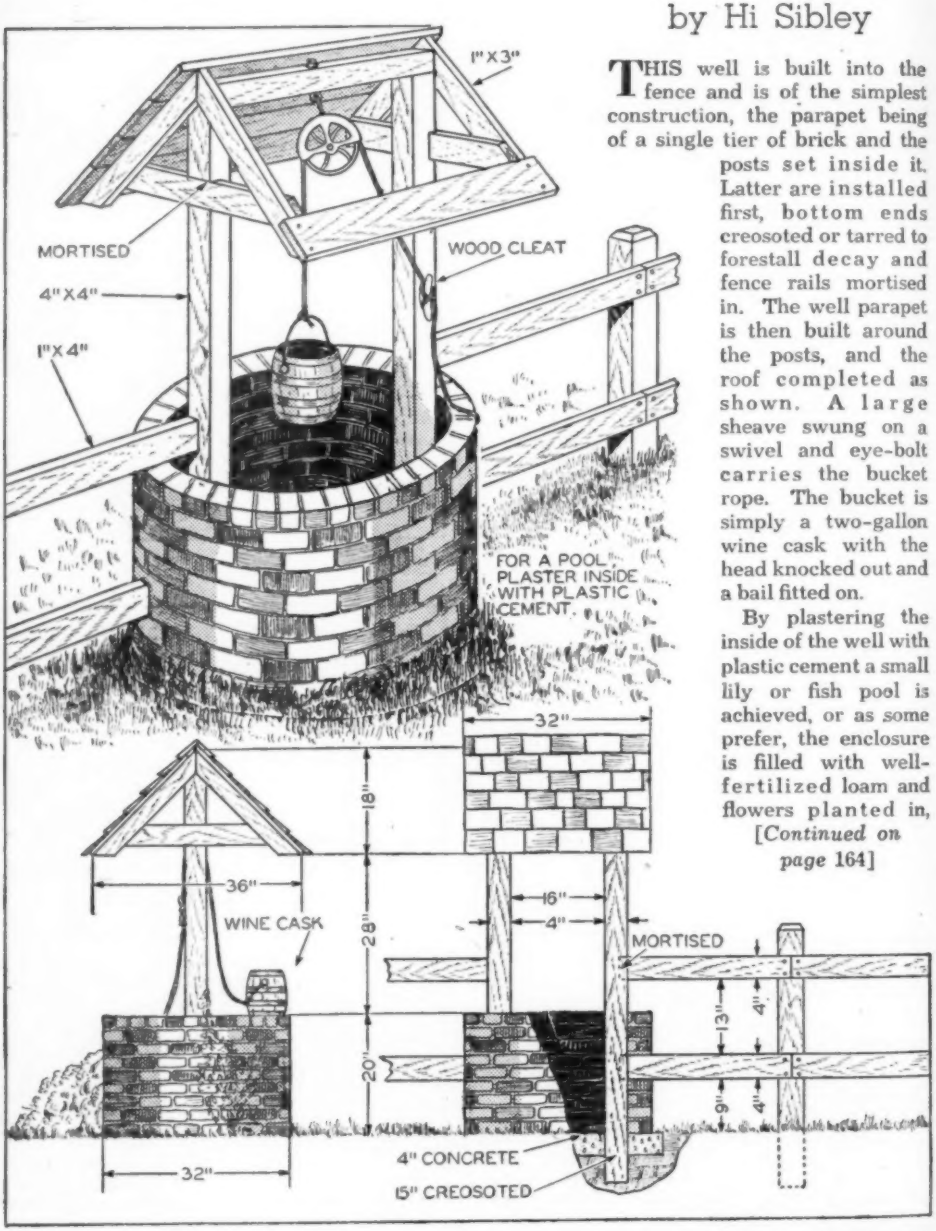
7.

8.

An Old Fashioned Well

—and an old oaken bucket

by Hi Sibley

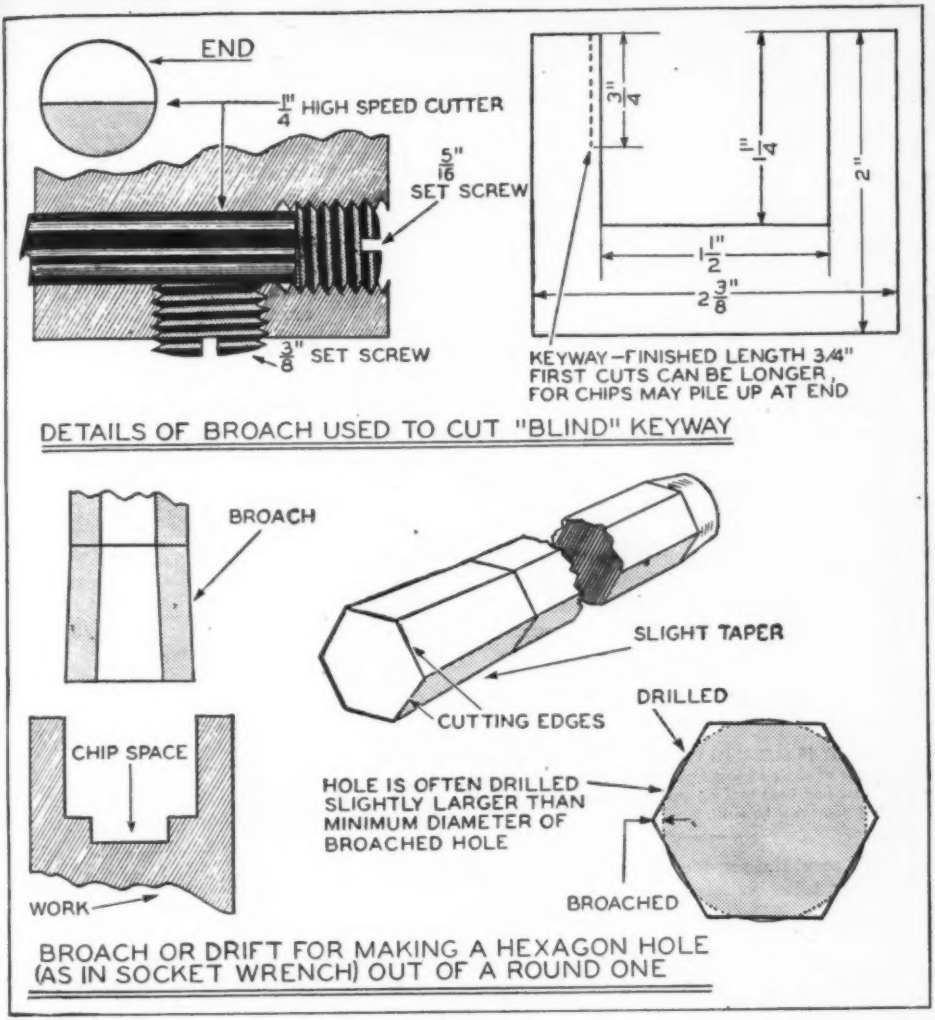


THIS well is built into the fence and is of the simplest construction, the parapet being of a single tier of brick and the posts set inside it. Latter are installed first, bottom ends creosoted or tarred to forestall decay and fence rails mortised in. The well parapet is then built around the posts, and the roof completed as shown. A large sheave swung on a swivel and eye-bolt carries the bucket rope. The bucket is simply a two-gallon wine cask with the head knocked out and a bail fitted on.

By plastering the inside of the well with plastic cement a small lily or fish pool is achieved, or as some prefer, the enclosure is filled with well-fertilized loam and flowers planted in,

[*Continued on page 164*]

Drawing below shows details of two types of broaches.



Maybe Broaching Will Do It

[*Continued from page* 103]

the only way the two mechanics could devise, and was much quicker than sending the job out to a shop that had a shaper, the stunt was worthwhile.

The average small shop can find numerous ways of applying broaching to tricky odd jobs and to limited production operations. While broaching in large manufacturing plants is done with elaborate machines, the small shop needs little more than a quantity of tool steel for making the broaches, and some method of forcing them into, through, or past the work. Often a hefty bench vise will do: and some broaches even may be hammered through the work; but, next to a regular broaching machine, by far the best machine for applying force is an arbor press.

A broach may take a variety of forms. Basically it is a tool that cuts metal as it is being forced through or past it, the action being much like that of a file. It generally is employed for forming square, triangular, and other irregular-shaped holes; for cutting splines and keyways, both internal and external; for finishing bored holes to close limits; for burnishing to give a smooth finish; and for surfacing or grooving various parts. Some

[*Continued on page* 166]

IDEAS for SERVICE MEN

"DOG TAGS" of metal, or the celluloid covered identification cards, are required to be worn on a lanyard round the neck in many camps and training stations. The cotton-covered wire lanyard issued by the Navy for this purpose is most uncomfortable round the neck, but only a shade more so than a string. A 24" length of white cotton tape is the thing—enclose one with your weekly letter to the Boy Friend so he may have a fresh clean one frequently. A 7-yard card of such tape costs five cents at most "dime stores," and the whole card may be easily enclosed with a letter.

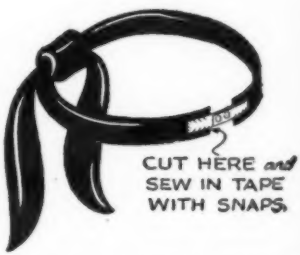
A FOLDING ELECTRIC IRON—the flat, compact "traveler's" type, weighing about two pounds, is a practical and appreciated gift for the service man. There is room for it in his outfit, and its usefulness more than offsets its slight weight. It does a very good job of pressing uniforms, in addition to ironing underwear and handkerchiefs . . . and modern training barracks have ample outlets for using electrical devices.

IF THE BOY IS SLOW IN WRITING HOME, send him a couple of self-addressed post cards each week—he'll at least find time to drop you a few lines in that way to let you know he is O. K.

DON'T send the service man such things as soap or toilet articles . . . he can get them at the canteen or ship's service store for less than you would pay. Home made candy, cookies, etc., are seldom good if they have to be shipped any great distance—most of the stuff received in the camps is pretty dry and crumbled, and eaten more for sentimental than gastronomic reasons. Post cards, stamps, a dollar bill now and then, candy bars that will keep, a carton of cigarets, sox he will be permitted to wear, a few good plain handkerchiefs . . . these are the type of gifts really appreciated.

THE SAILOR'S NECKERCHIEF is usually regarded as a necessary evil—though many wonder why it is even necessary! The only time one gets a really good "regulation" knot is the first time it is tied after being pressed. Send your sailor a couple of pieces of inch-wide black tape to which you have firmly tacked a couple of good snap fasteners, as shown in sketch. Then he can take his time in tying a perfect knot. Tack it with a few stitches in back part of knot to make it permanent, then cut neckerchief in two in the back, and sew on the tapes with snaps, making it easy to put on or take off neckerchief without ever disturbing the knot.

KHAKI shirts, trousers and blouses, when faded and dingy from repeated washing, may be restored to a snappy appearance by rinsing in strong coffee, well strained to remove grounds which might leave spots. Take an empty bucket to the mess



hall after evening chow and you'll usually find a mess cook who will co-operate. Garments should be wet, but well wrung out, when dipping into the coffee—then do not wring, but press out surplus and let them drip dry.

ELECTRIC SHAVERS are both popular and practical for the man in the service . . . but if the lad is a sailor, or expects to go overseas, let your gift be one of the brush type, rotary motor shavers, rather than the vibrator type. These rotary motors operate equally well on the AC current in camps and barracks, or on the DC usually available aboard ship; and, unlike the vibrator shavers, do not cause radio interference, nor constitute a hazard in the face of possible enemy listening devices.

WHITE BRAID on cuffs and collars of naval uniforms, soon becomes dingy, gray and brownish looking, from improper washing, or from misguided efforts to clean it with dry-cleaning fluids. Its service life may be prolonged, and the cost of re-braiding considerably delayed, if you'll send your Sailor Boy a "nail white" pencil from the cosmetic counter of the "Five and Ten." Tracing over the braid while still slightly damp from washing will give it a snowy-white appearance that will pass an inspection from the hardest-boiled Skipper!

REGISTERED AND INSURED MAIL are a frequent cause of trouble to the service man. In most camps, registered letters and insured packages are not entrusted to the mail orderlies, notice being given to the trainee who must then, perhaps, walk a mile or more to a main post office . . . which, more likely than not, will be closed at the hours when he can get to it. The various post offices in camp are so frequently shifted, their personnel changed, and mail re-routed, that any delays in delivery may result in a man not getting his mail at all.

If money is to be sent, use a money order and send it regular or air mail—not registered or special delivery. This will insure quickest possible receipt, and the money is protected. Packages, unless extremely valuable, should not be insured. "Special handling" on packages assures prompt service with minimum possibility of loss, and is the preferred way of sending to the man in service, as it will come through with the regular first class mail.

American forces feed the best of any in the world; but service chow does get monotonous after a while, and it is not noted for seasoning. A pleasant variation may be had if the home folks will send the soldier or sailor a shaker-top can or two of his favorite seasoning . . . say a small can of celery salt, one of onion salt, or a savory seasoning of mixed ingredients. He'll gladly carry it to the mess hall and use it to good advantage!

AND A WHETSTONE! Practically every man in service has a pocket knife—and very few of them will [*Continued on page* 170]

Odd Corners For Frames

[*Continued from page* 109]

secured. And always use a good glue on the joint surfaces. And, of course, it is understood that the joints must be squarely cut so that, when the members fit together, the frame corners will be a true 90 degrees.

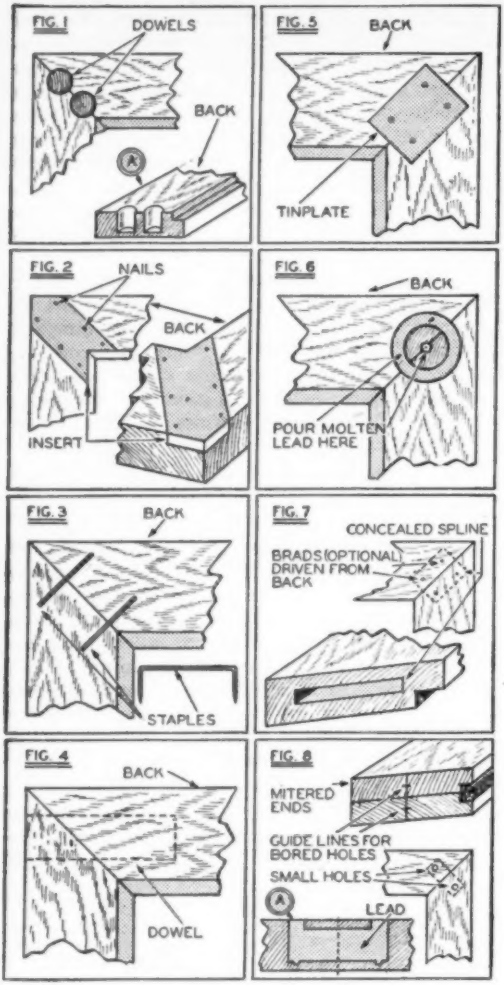
The various joints are shown in the sketches, and a few of the more unusual types are also shown in the photos. Their descriptions are as follows:

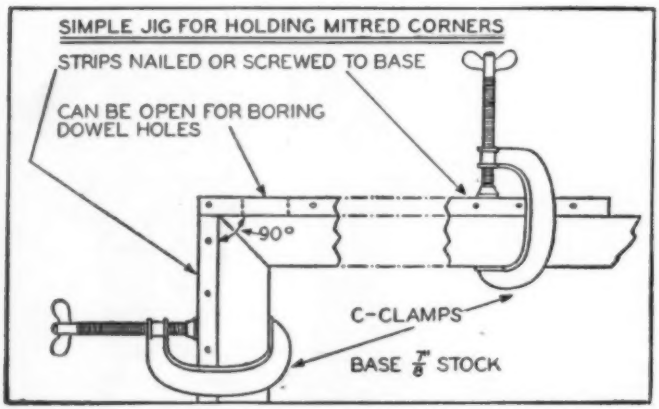
Fig. 1—Two short dowels in a joint as shown will increase its strength greatly by providing additional glue area. Clamp the frame pieces in a jig and bore the dowel holes from the back, and not quite through to the front surface.

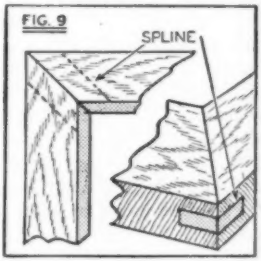
Fig. 2—A strip of wood inserted into the recess formed by the rabbeted edges of the miter joint increases the strength and stiffness greatly. Cut the rabbets on a circular saw or router. The insert can be a piece of thin veneer, and is held with small brads until the glue sets.

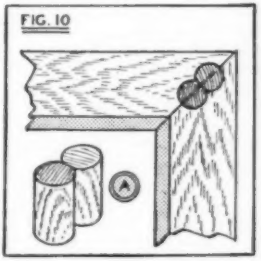
Fig. 3—A simple and quick way of securing a joint until the glue in it hardens consists of driving two or more slender staples as shown. These can be bent from brads or piano wire; or can be the kind inserted with a stapling machine.

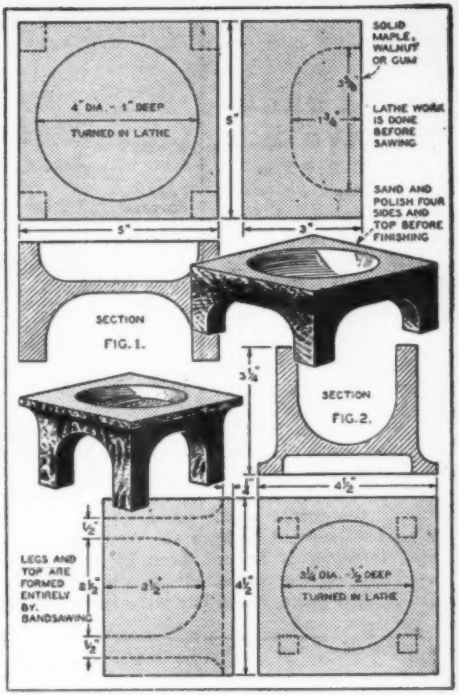
Fig. 4—A strong joint is produced by dowelling as shown. Use, preferably, two dowels in each joint, and insert them from top and bottom edges. The trick here is to hold the joint [*Continued on page* 170]




SIMPLE JIG FOR HOLDING MITRED CORNERS
STRIPS NAILED OR SCREWED TO BASE
CAN BE OPEN FOR BORING DOWEL HOLES
90°
C-CLAMPS
BASE 7/8" STOCK



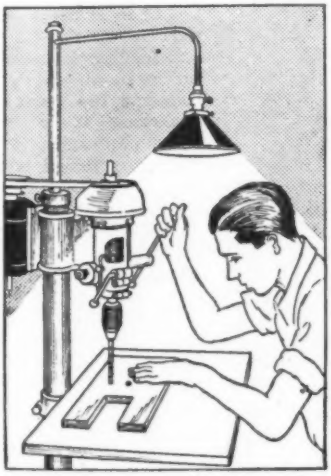




WOODEN BLOCK TRAYS

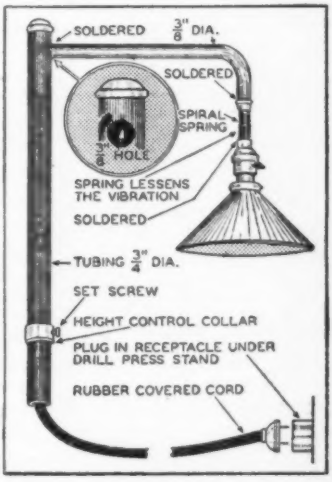
HEREWITH are shown two designs of a tray type exceedingly simple and quite easy to make. The two machines needed for their finishing are a lathe and a band saw having the usual 5″ or 6″ throat capacity. Because the best stock to start with is a single, solid block of wood, this type of project takes nicely that chunk of wood from the old apple tree in the orchard, or any special piece of walnut, maple or gum you've been wondering what to do with. The alternative of course, is to glue up a block from several thinner pieces to the desired size.

Consider Fig. 1. Here we have a solid wood block 5″ square and 3″ thick. Locate the center on the bottom, drill a small hole and screw this onto the center screw of the lathe faceplate. Turn out the top depression which should not be more than 1″ deep at the center, and not over 4½″ in diameter. While still on the face plate, sand the turning smooth, then fill with wood [*Continued on page* 172]

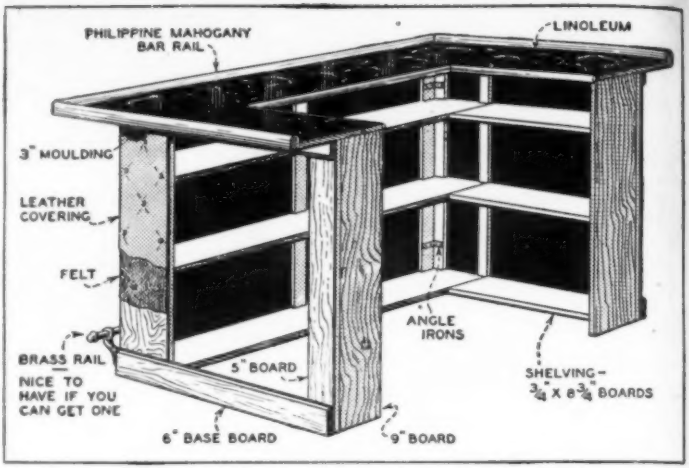


Machine Stand Light

PIECES of curtain rod and water pipe are used to make this handy shop light, which leaves no loose wires hanging around the machine. Other parts required are about 7 feet of electric cord, plug, receptacle, spring from discarded ironing cord, socket and a small shade. The set screw is made from an 8/32 machine screw. Collar should be drilled and tapped for the screw, which holds the light at desired height as it slides up and down the drill press column. It can also be hung from a rafter overhead if this is found more convenient.—*Joseph Williams.*



Right: Perspective of completed bar. To dissemble, unfasten angle irons at corners. *Bottom* drawing gives size.



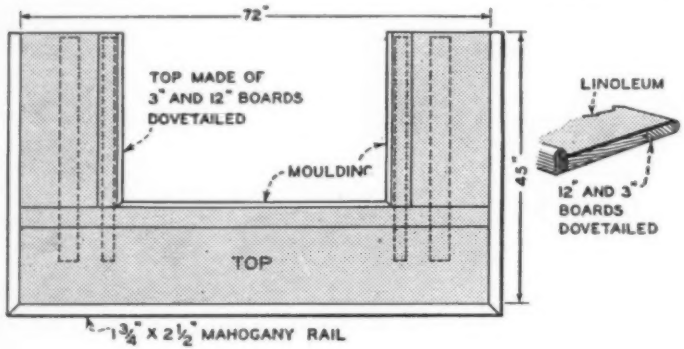
Build Inexpensive Bar

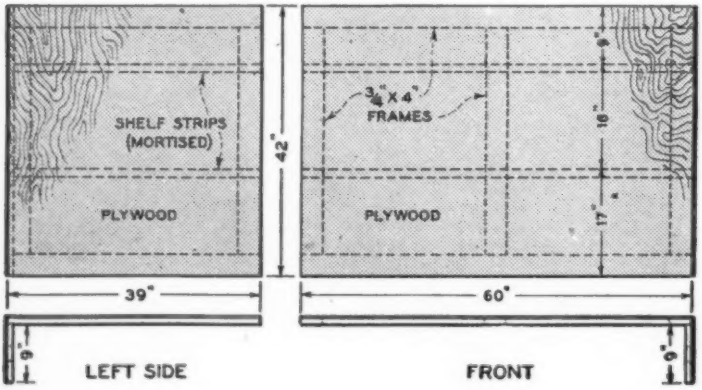
[*Continued from page 105*]

into the plywood, just enough to hold them while the paper nailing guide is torn away. Then drive them in tight, and clinch them on the inside.

The front and side frames of the bar are then joined with angle irons as shown in the drawing. Note that the leather runs around the narrow upright on the doorway end, but not around the corner at the other end, as this end is covered separately from the front portion. A neat juncture is formed here by tacking the leather along the concealed edges with ordinary flat-headed tacks. If the bar were not to be dismantled, the leather could be run clear around in one continuous piece.

The top of the bar is made up from 3" and 12" white pine planks, dovetailed as shown to save the extra cost of specially wide boards. A regular mahogany bar rail is used around the edges, and as so little is needed, you can afford to buy a nicely grained piece. Linoleum in a solid color makes the best covering to lay over this—b l a c k is good, too. However, if solid colors are scarce in your locality, a dark marble design will do nicely.



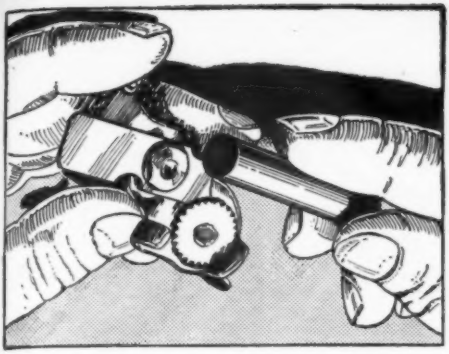


The cleats on the under side of the bar top fit over the upper portion of the sides, and four screws counter sunk in the top complete the work of anchoring it to the sides. Naturally, the sides are joined with angle irons before the top is set in place. Except for the screws in the top the fastenings can be either nails or screws.

The final step in the job is the finishing. If the o n l y mahogany used is in the bar rails, that will be the only staining and varnishing to be done, as the

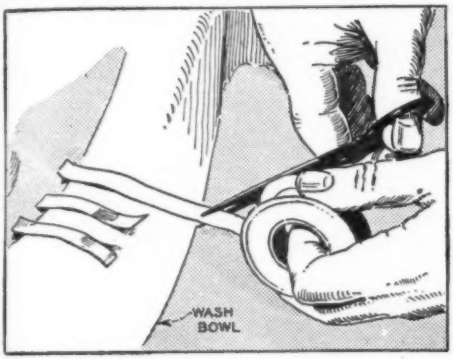
[*Continued on page 160*]

HOME AIDS



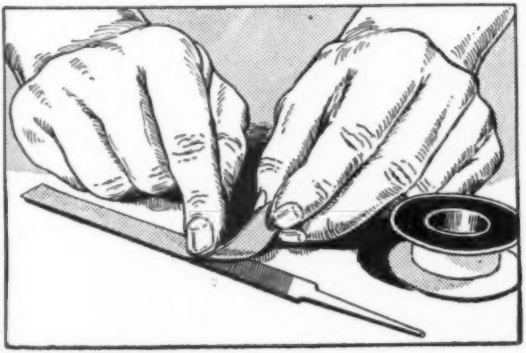
Cutting Adhesive Tape

WHEN cutting strips of adhesive tape, stick the free end to the washbowl or other smooth surface, as shown below. It cannot stick to the fingers and is easier to handle.



Cleaning Up A File

A METAL file of either the cuticle or workshop variety can be cleaned quickly by simply laying a strip of adhesive tape over it, then removing. Repeat the process several times if necessary.



Magnetized Can Opener

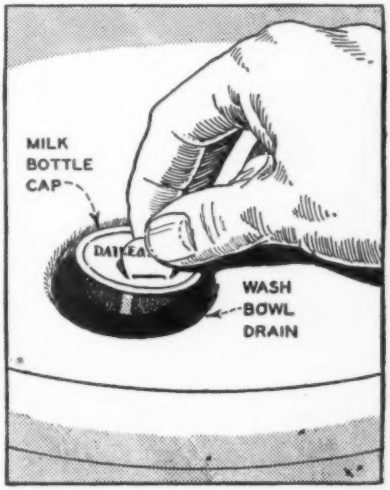
METAL particles that sometimes fall into a can of food as it is being opened will be collected by the opener if it is magnetized.

Emergency Cookie Cutter

IF YOU mislay your regular cookie cutter the glass top of the percolator will serve as an excellent substitute. The little knob on top assures a firm grip.

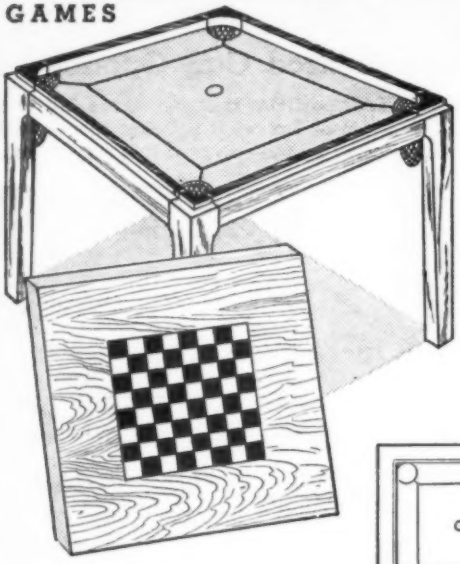
Wash Basin Stopper

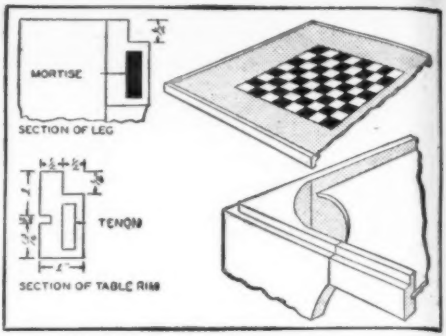
AN ORDINARY paper milk bottle cap makes a good sink stopper if the regular plug gets lost. It works surprisingly well and is illustrated below.



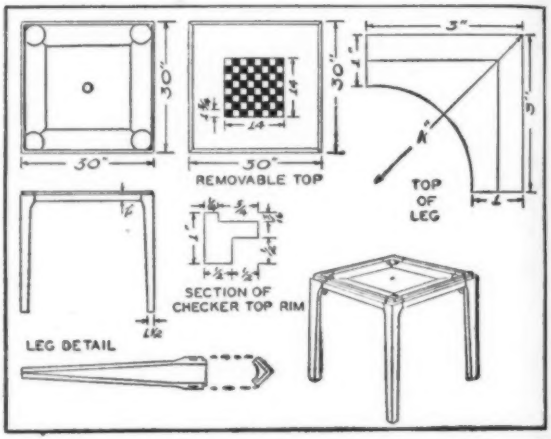
MULTI-TOP GAME TABLE

GAMES





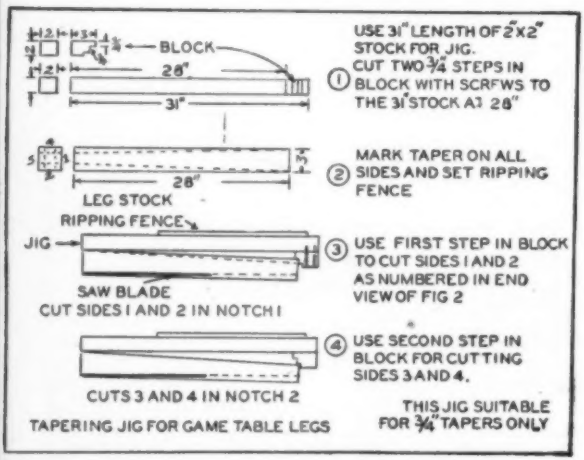
A double top permits the table to be used for a variety of games such as cards, checkers, backgammon and carom. Drawings above and below show details of table's construction while that at the bottom of the page outlines method of making jig to cut tapered legs.



by Howard C. Ford

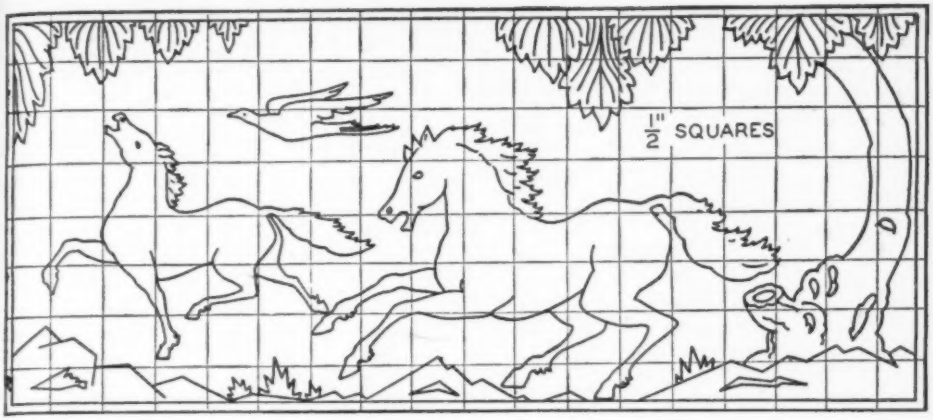
THIS game table is made doubly useful by the unusual feature of two tops. It is possible to remove the first top upon which checkers or cards may be played and to use the second top as a carom board. One group of players can use the top board on their laps or a table while another uses the original table and carom board. Thus a greater number may be entertained with the same equipment. If a piece of plywood with two good sides is employed in making the removable top, the underside of it may be laid out for backgammon or some other game. The table was designed for use in the recreation rooms of army camps but it is equally useful in the home or for any recreation group. The drawings and directions given should make it possible for any craftsman to construct this piece in the average home shop.

First the matter of materials. Use hardwood, maple or oak, for at least the legs and rails. If necessary to do so, fir plywood can be used for the tops of the game boards but naturally a nicer looking job will result if this is of the same [*Continued on page 174*]


BLOCK
28"
31"
USE 31" LENGTH OF 2"X2" STOCK FOR JIG.
CUT TWO 3/4 STEPS IN BLOCK WITH SCREWS TO THE 31" STOCK AT 28"
MARK TAPER ON ALL SIDES AND SET RIPPING FENCE
LEG STOCK
RIPPING FENCE
JIG
USE FIRST STEP IN BLOCK TO CUT SIDES 1 AND 2 AS NUMBERED IN END VIEW OF FIG 2
SAW BLADE
CUT SIDES 1 AND 2 IN NOTCH 1
USE SECOND STEP IN BLOCK FOR CUTTING SIDES 3 AND 4.
CUTS 3 AND 4 IN NOTCH 2
THIS JIG SUITABLE FOR 3/4" TAPERS ONLY

TAPERING JIG FOR GAME TABLE LEGS

Below is the pattern used for the original box shown in photos. If you have an artistic inclination you may prefer to create a design of your own, or copy a favorite picture.



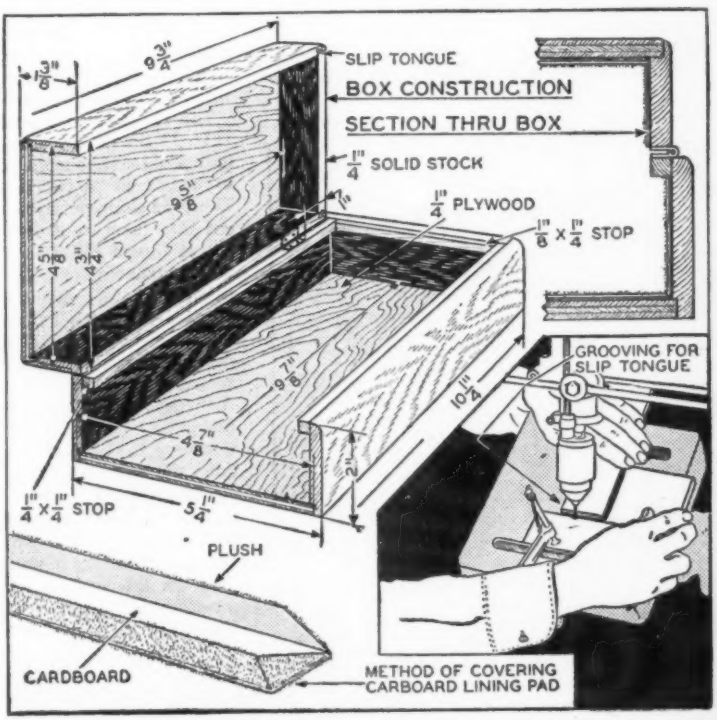
Inlaid Glove Box

[*Continued from page* 111]

Inlay the large horse first. Strip the celluloid from its backing with a knife blade, rub off the cement, and lay it in position. Trace around it with a sharp pencil. Take the work to the drill press and recess to within about 1/16" of the line with a 1/4" router bit, afterward removing most of this with a sharp pen knife. Now replace the inlay and tap along the back with a hammer, which will make a sharp impression in the wood. Trim along this line and again replace the inlay, using the cut as a base to prevent slipping, and tap further around the outline. Trim and repeat until the whole figure is routed out. Sand the celluloid again, coat it with cement, apply cement to the wood, and when tacky, force in place, using a hammer or clamp. The beveled edge will wedge in, making a perfect fit.

Inlay all the parts in this manner. Inlay bits of wood in the tree trunk, sawing them by hand with a fine blade and lots of undercut. Allow 24 hrs. for drying, then scrape and sand smooth. Scratch the lines with a sharp point, taking several light cuts rather than one heavy.

While the inlays dry build the box. If possible, make the rabbeted and [*Continued on page* 160]



Automatic Record Changer

[*Continued from page* 113]

A sheet of $\frac{1}{16}$" sheet iron or any other metal, cut and drilled as in Fig. 2 will do for the base. One quarter inch plywood can also be used if one prefers to work with wood.

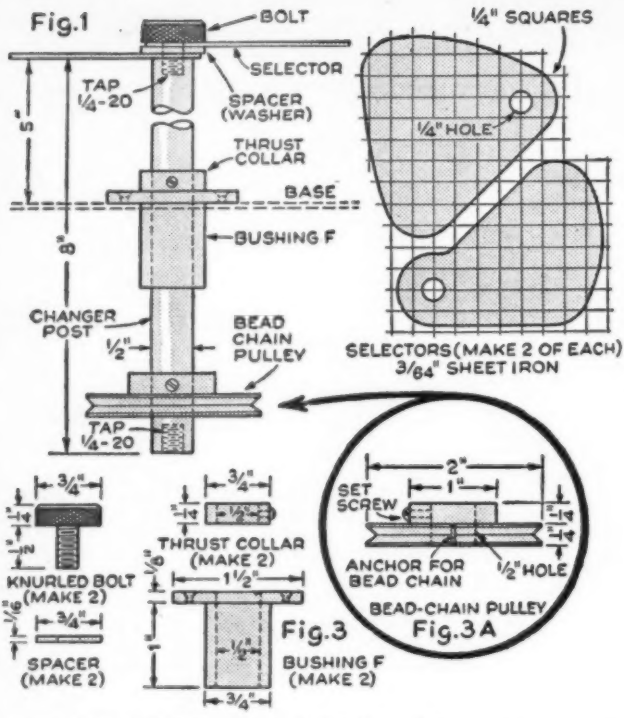
Locating and attaching the turntable motor to the base must necessarily be left to the discretion of the builder as the procedure will depend on the type and make of turntable used. At any rate, the only requirement in placing this unit is that the center of the record must be halfway between the changer posts; that is, half way between the ¾" holes indicated on Fig. 2.

The centerpost of the turntable must be extended upwards far enough to go through the center holes of all the records on the stack to be played. The extension should be of the same diameter as the original centerpost, and may be joined to the latter by means of a small pin. The end of the center is drilled to receive one end of the pin, which should be about an inch long, and the end of the extension shaft is drilled to receive the other.

The changer posts and accessories are shown (Fig. 1), in its assembled form and (Fig. 3) its individual components. Bushings (F), bolt down to the base in the two ¾" holes provided for them. The bead chain pulleys each have a hack saw kerf cut into them as shown in Fig. 3A and in this cut is forced the U-shaped bead chain anchor which is shown in Fig. 3. This acts as an anchor on the bead chain, preventing slipping and insuring a positive drive at all times.

The bead chain used here and in one other place described later is the standard electric light pull type chain and can be bought in any ten-cent store. A three foot length will be sufficient. In operation the pulley (bead chain) only makes a ½ turn; therefore the bead chain anchor never disengages from the chain itself.

The reversible motor used to drive this unit can be coupled in various ways depending entirely upon the size and shape of the motor. In the original setup it was gear driven by fitting a gear on the end of the ½" changer-post and mounting the motor so it would engage this gear. Fig. 4 is a bottom view of the drive mechanism without the turntable motor. The D.P.D.T. (double pull, double throw) toggle switch shown has a two-inch extension with a slotted end soldered



Above: Details of changer posts and selector leaves. Base, shown *below* may be either metal or plywood. If mounted in console cabinet it would be a good idea to "float" it on rubber sponges (available in 5c and 10c stores despite rubber shortage). This will minimize noise and vibration.

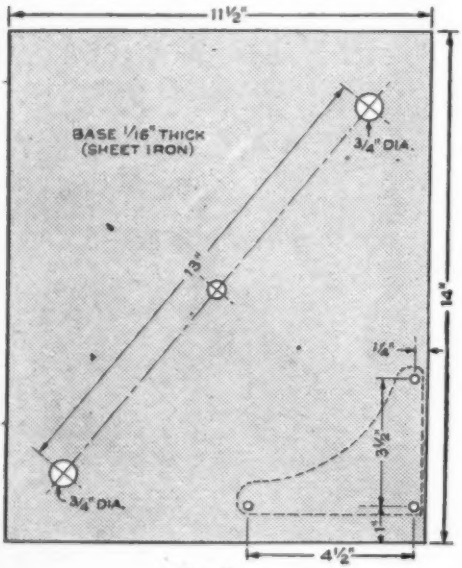


Fig. 2

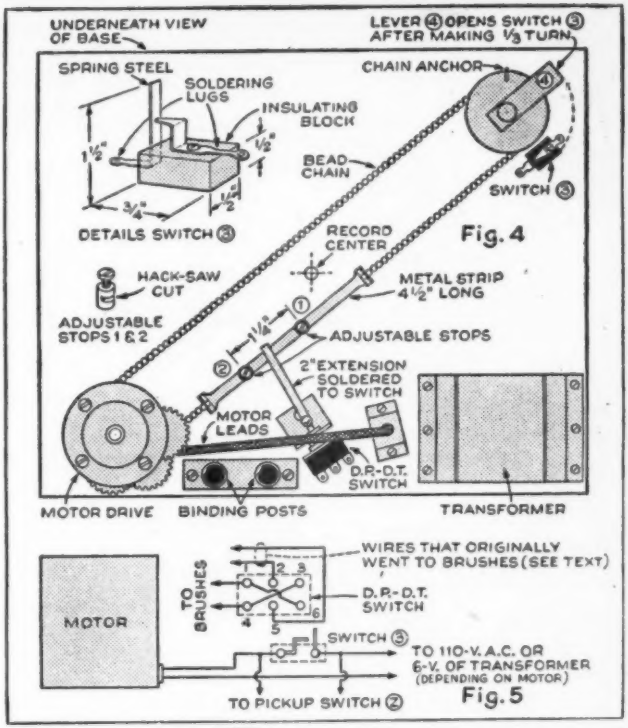
to it. The metal strip connecting the two ends of the bead chain together slides freely in the slot in the end of this extension until the stops (1) and (2) hit and throw the toggle switch. This provides the proper timing interval before the motor reverses and returns to its original position. The distance between the stops (1) and (2) determine the amount the motor will turn the changer posts before reversing and should be adjusted so that the mechanism makes slightly less than ⅓ turn before reversing.

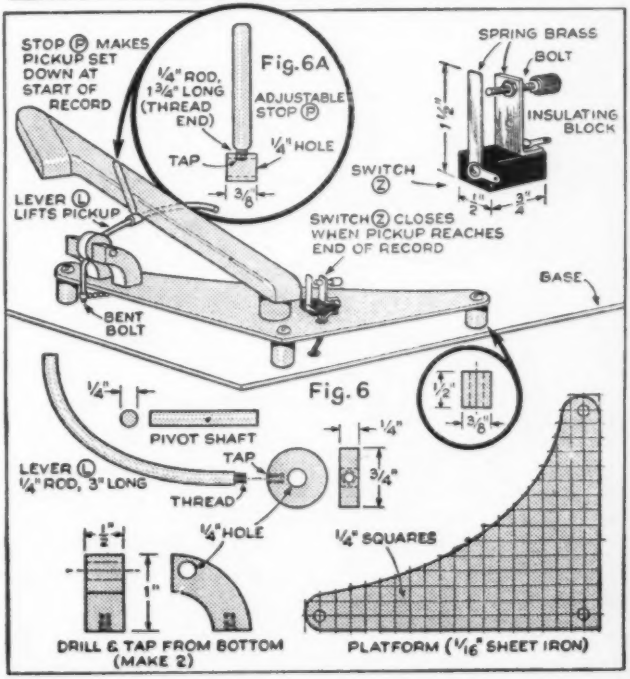
Fig. 5 is a diagram of the electrical circuit, which is very simple and self-explanatory.

So much for the underneath mechanism. It remains only to locate the unit illustrated in Fig. 6 and the changer is practically complete. An explanation of the operation might be appropriate at this time. To start let's assume a record is playing. The pickup arm gradually moves into the center until at the end of the record it hits pickup switch (Z). This completes the electrical circuit (Fig. 5) and the motor starts to turn the changer posts. When these posts have made slightly less than ⅓ turn the toggle switch shown on the underneath view (Fig. 4) has been thrown to its opposite position and the motor reverses. It continues in reverse until just after the toggle switch is again thrown to its original position at which point auxiliary switch (3) is opened and the motor stops turning, having completed its cycle. In the meantime, while the changer posts are rotating the bead chain shown in Fig. 6 on the top side of the changer is wound up on a selector shaft, pulling lever (R) and lifting the pick-up off the record while another record drops in place.

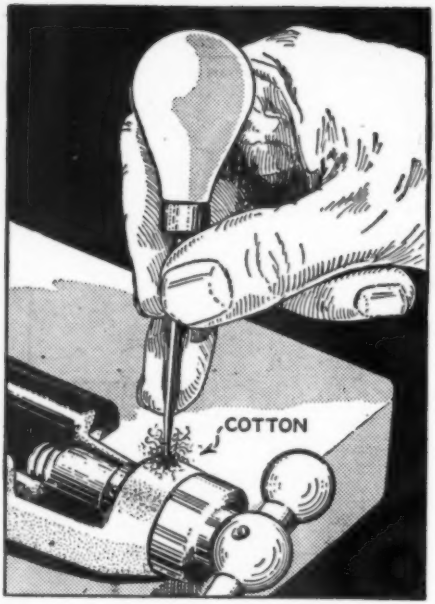
Lever (R) has an adjustable stop (P) shown in Fig. 6A which is so placed as to let the pickup down at the beginning of the record. It is necessary to adjust this when going from ten to twelve-inch records. As soon as the pickup is lifted

[*Continued on page 156*]





SHOP SHORTCUTS

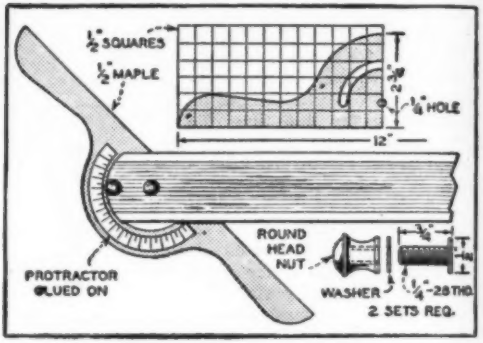


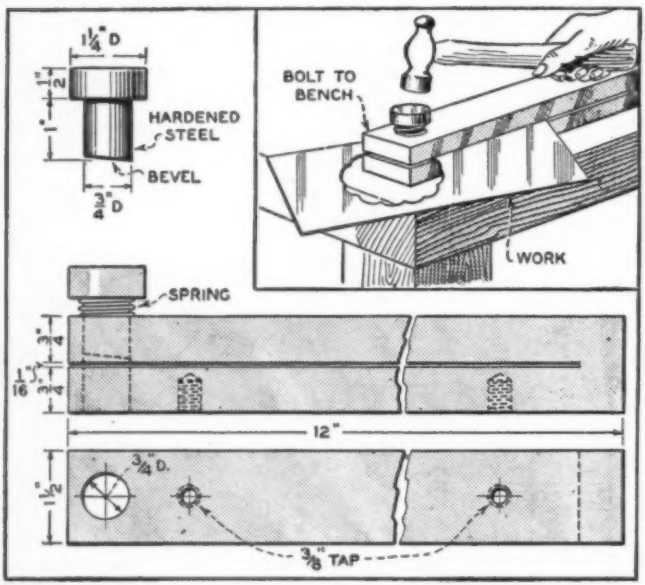
Wads of Cotton Keep Oil Holes Clean

OIL holes on shop machinery are likely to collect dirt and grit in operation. Stuff them with cotton to absorb oil and keep out dirt.—*W. E. B.*

Protractor T-Square

AN ALL-ANGLE T-square can easily be made from the straight edge of an old T-square and a new shop-made head. The head should be cut from a hard wood, of light color, and slotted with the scroll saw, as shown. A five and dime celluloid protractor is cemented to the head around the slot. Pointer bolt is tightened at desired angle.—*W. G. L.*



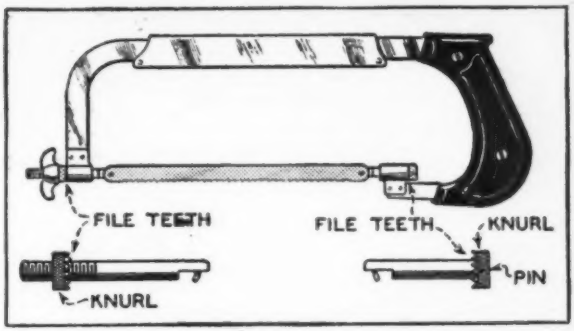


Make a Tool for Metal Nibbling

THIS metal nibbling tool will solve the frequent problem of cutting large holes in sheet metal around the workshop. A square bar of steel of the dimension shown is drilled and tapped to take two bolts which are to hold it to the work bench. It is then slotted to take the sheet metal, and drilled for the hardened steel pin that does the actual cutting. The base of this pin should be ground off at a slight angle to aid in the cutting process. A spring is placed under the head of the pin.

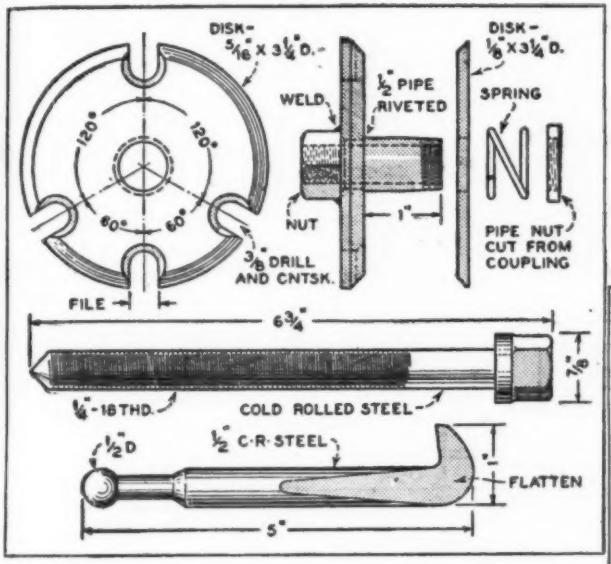
All-Angle Hacksaw Is Easy to Make

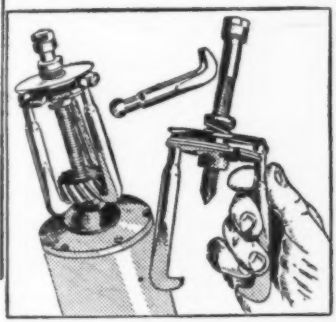
TO ADAPT the workshop hacksaw for "all-angle" work, file teeth into the tubular parts of the blade holders. The parts to be inserted are made from bolts and nuts as shown, and filed to form teeth also. The nut at the handle end of the saw is then pinned to the bolt, and the end of the bolt filed off flush.—*H. R. W.*



Handy Gear Puller

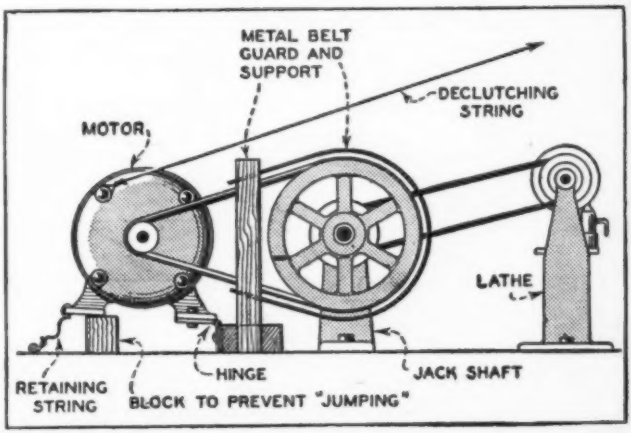
THIS 2 or 3 arm gear puller is made mainly from junk parts. The ball ends are machined on cold rolled bars before forming the hooks. Assembled as shown, center bolt is drawn up with fingers, and tightened in with wrench. —*B. N.*

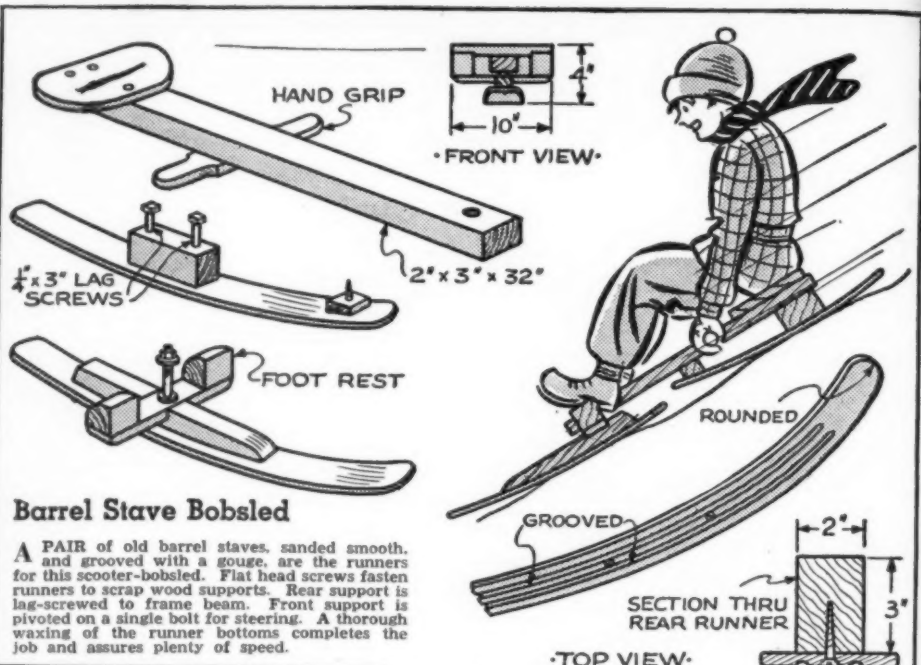




Lathe Clutch

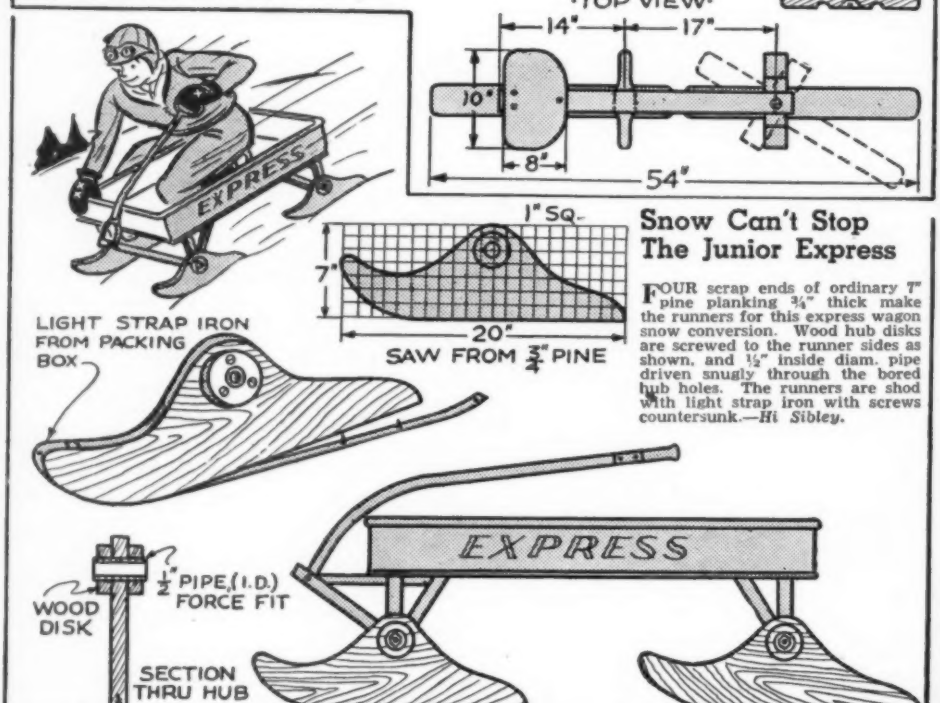
WHILE the weight of the motor that powers the workshop lathe is often used as shown to maintain tension of the pulley belt to the jack shaft, the set-up may also be used as a clutch. Simply form a sheet metal guard around the large pulley on the jack shaft to hold the V-pulley belt from falling away from the pulley when the tension is released. A string or cable attached to the top of the motor is used to de-clutch belt.—*G. E. D.*





Barrel Stave Bobsled

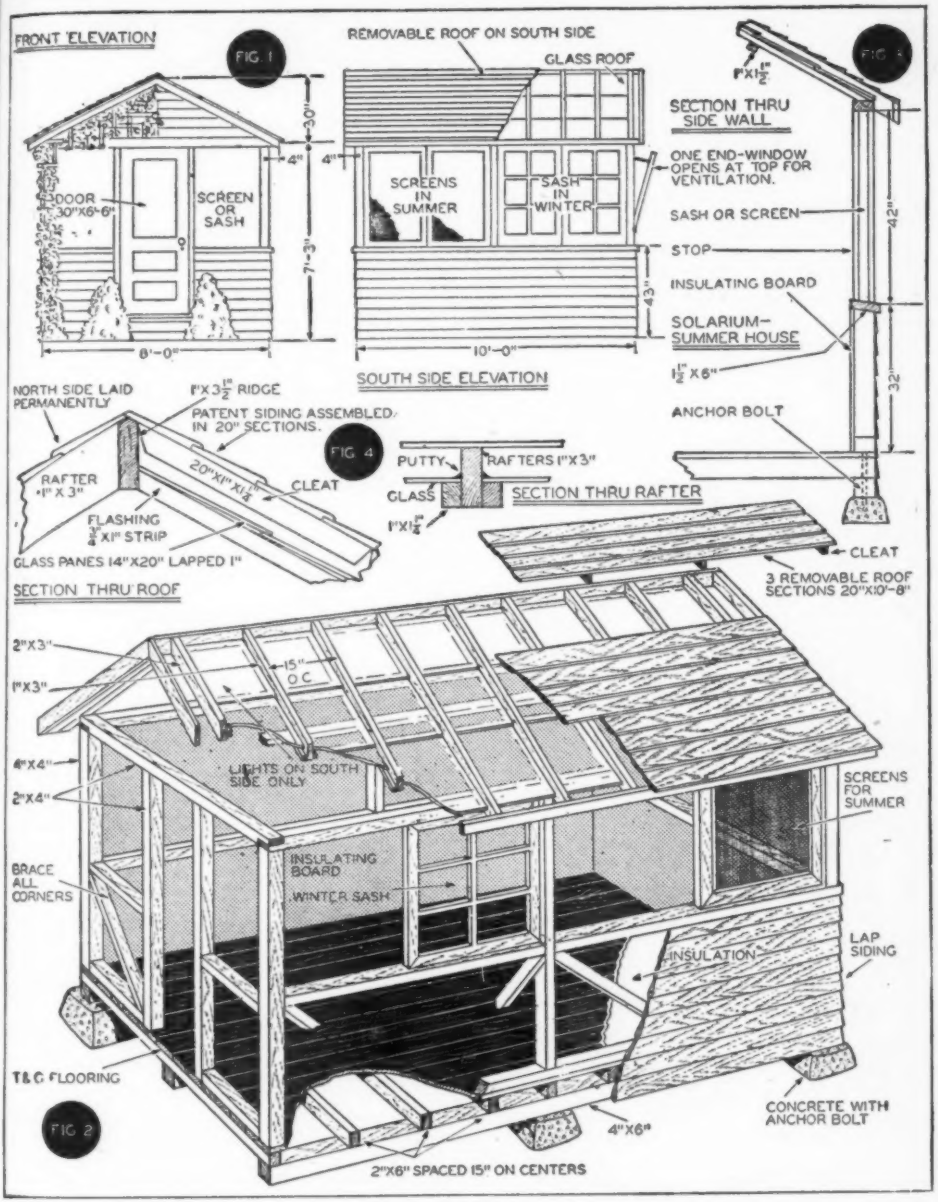
A PAIR of old barrel staves, sanded smooth, and grooved with a gouge, are the runners for this scooter-bobsled. Flat head screws fasten runners to scrap wood supports. Rear support is lag-screwed to frame beam. Front support is pivoted on a single bolt for steering. A thorough waxing of the runner bottoms completes the job and assures plenty of speed.



Snow Can't Stop The Junior Express

FOUR scrap ends of ordinary 7" pine planking ¾" thick make the runners for this express wagon snow conversion. Wood hub disks are screwed to the runner sides as shown, and ½" inside diam. pipe driven snugly through the bored hub holes. The runners are shod with light strap iron with screws countersunk.—*Hi Sibley.*

All-Year Play Cottage



NOW that we are spending more time at home to save our tires we might as well derive all the pleasure we can out of the situation. This all-year recreation house will contribute much to the family enjoyment.

As shown in Fig. 1 this trim little structure has a removable roof on one side which exposes a glazed area [*Continued on page* 174]

THE SCHOOL SHOP

Conducted by Frank Petraglia,

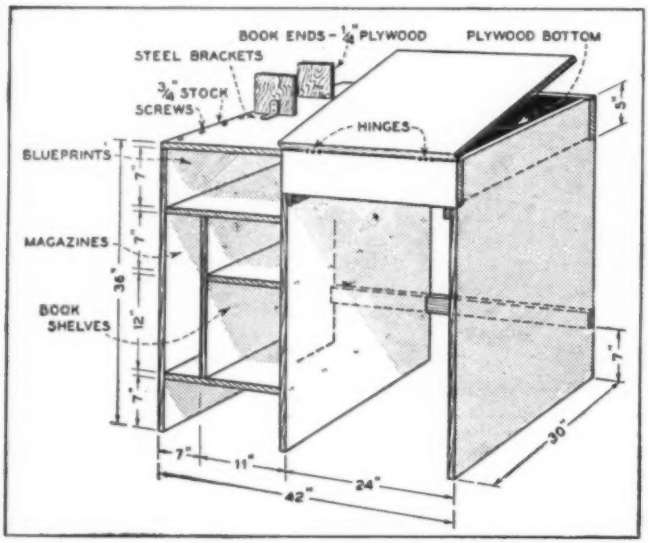
Shop Instructor, Samuel Gompers Industrial High School
New York City

Easily-Built Home Or School Shop Desk

A PRACTICAL workshop desk is one of the most useful pieces of shop furniture which can be added to your working equipment. Books, magazines, blueprints, jobsheets and sketching or drawing materials have a way of cluttering up odd nooks and corners unless assigned a proper and logical place in the home workshop. To have these materials systematically shelved and readily accessible is, of course, an advantage. Beyond this, the workmanlike aspects of your shop are enhanced.

Economy and ease of construction are the principal features of the desk shown herewith. Many of you school-shoppers are handy with carpenter's tools; however, a good number of you could use a lot more practice when it comes to applying advanced wood joinery in making things. This project, however, is not intended as a practice piece. On the contrary, all wood joinery is scrupulously avoided for the simple reason that we want you to build this desk, with a minimum of possible trouble and confusing details and put it to work. Later on you can rebuild the desk to suit the scruples of your advancing craftsmanship. If you know your joints already, then so much the better. You can follow the general design of this desk and work out the most desirable system of construction to be used according to your own tastes and ingenuity.

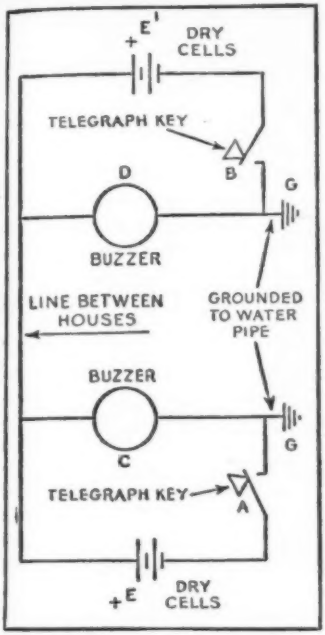
Simple, flat, butt-joints are used throughout. In other words, you simply cut your stock straight and square, and fasten the various ends together with suitably large and frequent wood screws of 1½ to 2½ inches. Three-quarter inch, or even one inch stock can be used for the sides and top while one-half inch stock will do for the magazine and book-rack sections. Any common hardwood will be preferable, of course, in the selection of stock to be used. You will want a good smooth finish for your top; the sides will not require such critical considerations. If you purchase the wood for this desk you may, of course, exercise your faculties of selection to suit your budget. On the other hand, an hour's rummaging through city lots or country barns may yield all the stock you need.



All details of sizes are clearly indicated in the drawing, and these adhere to more or less standard measurements as to height and width. Note that the two principal supporting arms of the structure are in the back-pieces. These are screwed to the three uprights. Similarly, the front strip, over which the cover which is the drawing board half of the top is raised, also serves for providing support and ruggedness. An additional strip may be added about one-third distance from

[*Continued on page 176*]

Simple Two-Way Telegraph



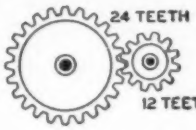
THE idea of connecting up a two-way telegraph line with the fellow next door or within two or three hundred feet of your own home is a popular one. The diagram illustrates how this can be done with a minimum of wiring. Only one wire is run between houses. Switches are dispensed with, yet a pressure on either key operates both telegraph instruments or buzzers.

The necessary equipment, as indicated, include buzzers and two telegraph keys, complete details for the construction of which you will find in the new MECHANIX ILLUSTRATED RADIO MANUAL (No. 3) under the title "A Professional Telegraph Key." To supply current, two or three ordinary dry cells may be used on lines over fifty feet; below this one cell at each operating post will be sufficient. Bell wire can be used for all connections, although if it is necessary to have the wire between the houses strung over 50 feet between supports, use radio antenna wire at these points in the circuit. At each house, a wire is run to a ground connection, preferably a water pipe, as at G.

When Key A is pressed during the dot-and-dash signals, current flows through buzzer C and also through D by way of the wire between the houses and the water pipe return. As key B is depressed, both instruments are operated by current from battery E 1. If a message is being sent from one end of the line and the fellow on the other end desires to "break-in" (as in commercial telegraph practice), he presses his key and the buzzers will sound continuously.

Particular care should be given to prevent a direct short-circuit by connecting each battery with positive toward line between houses.

1. What is the ratio of gear A to gear B?



2. Which of these emergency calls is the

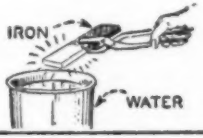
1.- DISTRESS SIGNAL
2.- URGENT SIGNAL
3.- SAFETY SIGNAL

X X X
S O S
T T T

3. Which common wood is designated as

4. Which wood is most commonly used in pencils?

5. What is the name of the process whereby iron is first heated red hot, then dipped in cold water?



6. The lowest tensile strength of wrought iron used in hoisting chains is

5,000 LBS. RER SQ. IN.
20,000 LBS. PER SQ. IN.
40,000 LBS. PER SQ. IN.

HOW MANY OF THESE QUESTIONS CAN YOU ANSWER? If you can get four out of the six you're good. Answers will be found on page 176.

STUDENTS' PROBLEM BOX

1 Q. Can you tell me the name of the chemical which radio repairmen use for cleaning out volume controls which have become noisy due to accumulated dirt inside?—*C. B.*

A. In radio service work carbon-tetrachloride, or Carbona, is used. Inject a half eye-dropper full into the control while working it back and forth several times.

2 Q. It is a common experience to find when using a star drill that it wedges itself in the stone or concrete, causing difficulty in turning or removing it? Is there some kink for overcoming this trouble?—*H. K. H.*

A. Drill a hole in the upper end of the drill shank and insert a hook bent from ½ in. steel rod about 8 in. long. This rod is then held horizontally to push or pull to dislodge the drill.

3 Q. How would you find the center of gravity of any flat or plane part?—*F. L.*

A. This requires the use of a plumb bob or weight suspended from a string. The part, or a cardboard pattern, is suspended together with the plumb bob from any point near its edge, and the plumb line should be marked on the piece. The object is suspended from another point, and the line again marked. The center of gravity is found where the two lines intersect.

4 Q. Over a period of time I have accumulated a number of worn-out fountain pens. Can they be put to some special use?—*H. C.*

A. Unless you contribute them to the rubber conservation campaign, you can convert some of them to use as electrical test prods. With a little ingenuity you can work out the details.

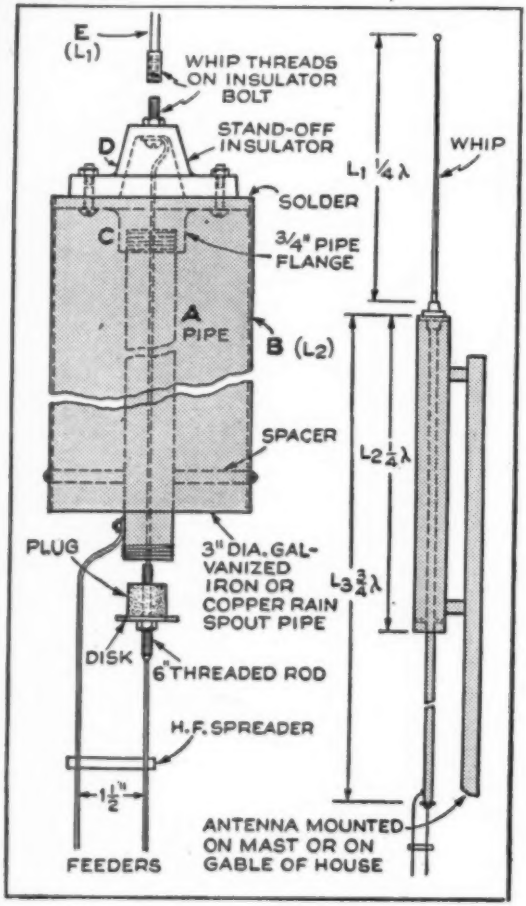
5 Q. Can you give me some help on an awning problem? How may the color, which has faded, be restored?—*P. S. W.*

A. Paint with a solution of raw linseed oil, 2 parts, and 1 part turps This removes faded appearance.

Coaxial 2½ Meter Antenna

RADIO

made from easily-obtained materials



OF ALL the types of ultra-high-frequency antennas tried for consistent use the Coaxial type has been proven to give best results. The type shown has been accepted by committees of Public Safety to be employed in Civilian Defense work but is herein simplified so the builder can construct it from materials procurable in about any hardware store, lumber-yard or radio supply store. It is constructed to operate on a wavelength of 2½ meters but will also operate efficiently on 1¼ or even ¾ meters. Any ham or handy man can build it and it will prove well worth the small trouble and expense of putting it together. First, determine your operating frequency. For example—suppose you intend to work on exactly 112 megacycles. Use the following formula for L1 and L2. Length for 112 mc. equals $\frac{2712}{112} = 24.2$ inches, meaning that the whip L1 (or E) and L2 (or B) will be made approximately 24.2 inches long (¼ wavelength). Thus any frequency can be matched from 112 to 116 mc. With this in mind you can go ahead; and still using as an example 112 mc. construct the parts as follows.

Shorten the whip L1 to 24.2 inches to its bottom end including the threaded socket. Then fashion L2 from a piece of galvanized or copper rain spout 3 in. in diameter a cylinder 24.2 inches in length. Grind down a ¾ in. iron pipe flange so the flange itself makes a snug fit into one end of L1 and solder it securely in place, flange flush with the end of the cylinder. At three equidistant points near the bottom of the cylinder fasten three 1-in. pieces of high-frequency insulator as shown. On top of the exposed pipe flange bolt a high-frequency stand-off insulator, its protruding threaded rod to fit the base of the whip. Then fasten a rubber covered No. 14 wire to the insulator bolt as shown. This can be soldered to a 6-inch threaded rod at the bottom end which is in turn passed through a ¾-in. insulating plug with retaining disk and nut as indicated.

The pipe standard A is composed of a piece of ¾-in. iron pipe ¾ of a wavelength long (in this case 72.6 inches) the wire passing up through it after it has been threaded into the flange C and then the wire drawn tight by the nut on the lower threaded rod. One feeder attaches direct to the bottom of this longer pipe and the other feeder to the coaxial wire leading to the whip. The three insulators at the bottom of the cylinder provide centralizing of the cylinder about [*Continued on page 176*]

Your Wartime Car

by Frederick C. Russell

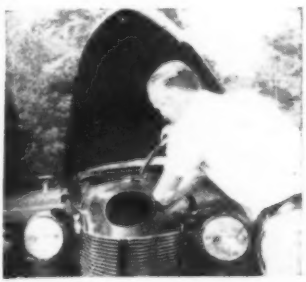
If you have a problem with your car, ask Mr. Russell. Just send stamped, self-addressed envelope for personal reply to your letter.

Is it all right to let the engine run while draining off the cooling system and filling it up from a hose? T. L. M.

If the engine is quite hot you may crack the head or block. Whenever adding water to a warm engine do so slowly and with the engine running.

Try it!

Next time you are at a filling station use the air hose to blow out leaves and insects from the radiator core. Direct the air stream against the core on the engine side.



I have done a lot of work on the fuel pump but still can't get enough pressure. The diaphragm is new and I have also replaced the line from pump to carburetor. S. L. Answer: You will find the gasket between the pump flange and the crankcase is too thick.

Since adjusting the brakes the pedal reserve is zero. What's wrong? S. F. Answer: The pedal stop lock ring is out of its seat in the master cylinder.

In spite of adjusting the horns I can't get a very loud warning from them. Should I install boosters? W. M. B.

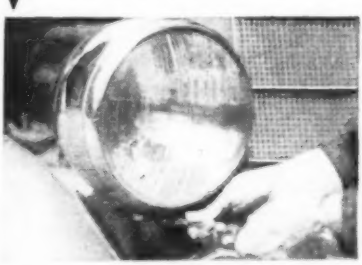
You can decide this point by running a wire directly from the battery to the horns. If they blow normally you'll know that there is excessive line loss and that boosters or relays will give you results.

Is it necessary to remove all the old finish before spray coating the car? R. A. Answer: It's better to do this. At least remove any of the old finish that is blistered or loose. It is a good plan to put ammonia over the old finish and then sand it.

Tests show that the fuel pump on my car is erratic. I don't want to replace this with a rebuilt pump if I can avoid it. B. L. D. Answer: There probably is a broken rocker arm return spring.

What can be done to keep the reflectors from getting so dull on my car? It does not have sealed beam headlights. K. E. F.

The gaskets around the lenses are probably broken and old. Also keep the lense holders tight. Vibration loosens these frames.



Recently when I turn on the ignition the engine starts without need for touching the starter button. This is very annoying when I want to use the radio while the car is parked, for the radio is wired through the ignition switch. H. B.

Answer: This job—a 1941 model—has a starter switch control which uses a small ball and plunger. The unit is located in the carburetor. Apparently it has picked up some oil which has, in turn, attracted dirt. Cleaning the unit with white gasoline should solve the problem.

There's a very annoying rattle in the front of my car, but I can't seem to locate it. Have checked the fenders, bumper, license plate and engine accessories. But the noise is still there. Have you an idea? H. L.

Take a look at the baffle plate between the radiator grille and the radiator.

I Am A Workshop Widow

[Continued from page 41]

If my electric grill turns up missing, I have only to go to the garage, where I will probably find it being used to heat a glue pot. All sorts of things disappear from the house. Good cooking utensils become paint pots, clothes pins become hooks for drying film. Floor lamps and appliances vanish and turn up later minus cords, plugs and elements. When the motor vanished out of the vacuum cleaner, I said nothing. Two days later it came back in the form of an electric mixer that threw batter all over me and the kitchen when I tried to use it.

Who is the fiend whose workshop has widowed the author of this wail? William J. Burton of Hollywood, Calif. We expose his identity not to encourage women sympathizers with Mrs. Burton to beat him about the head with umbrellas, but to remind Mlers that Mr. Burton has authored many workshop kinks appearing in the how-to-build section.

My old treadle sewing machine was motorized some time ago with the motor taken from a discarded pop corn machine, but not for my benefit. My husband didn't like to work the treadle while sewing canvas and leather on it.

I'm afraid to have company any more. Aside from the usual hazards of door bells, guests are likely to walk in on my husband, on the floor with blue prints scattered all over the carpet, pencil in one hand, and a glass of beer in the other, trying to figure just how he is going to build the boat that's going to take us to the South Sea Islands, away from the mad city, to a land of work-less ease.

When we were annoyed by a "peeping Tom" my husband, of course, had the solution. He'd build a trap to warn us of the peeper's approach. Thread was draped about outside, and eventually came in through a hole drilled in the front window. To this an alarm was connected, and the trap was pronounced not only finished, but perfect. It was several evenings later when a neighbor dropped in for a chat. My husband was discussing some new gimmick with a friend, while doing some elbow bending in his favorite beer joint, so we had the house to ourselves. About eleven o'clock the alarm went off. It sounded like the fog horn on a ship in distress. I left the chair and went two feet in the air, as did my friend, then we froze like two cigar store Indians, in our chairs.

When we finally summoned up enough courage to investigate, we found that our peeper had dug two-inch-deep holes in the ground in his haste to escape.

My home life is beautiful, it consists of picking up junk and putting it in little piles, and then if I can get my husband's nose out of a mechanical magazine long enough to take it out to the shop, that's heaven. We have a priceless collection of mechanical magazines that date back five years, scattered about the house. The ones my husband doesn't buy, he reads gratis in the corner drug store.

I don't mind my house looking like an insane inventor's nightmare, and I can always make toast in the oven if my toaster is doing duty as an electric welder, but there are some things I can't stand.

Last week, just as I was about to put dinner on the table, my husband came rushing in the house from the garage, leaving big black smudges from his dirty hands on the white painted front door, and demanded that I come at once and hold something while he drilled a hole in it. I tried to explain that I couldn't leave the cooking, as it would burn. "This will only take a minute," he said, "just leave the stuff on the stove until you get back." Of course I went. Thirty minutes later, I glanced out of the garage, and saw smoke pouring out of the back door. I dropped what I was holding, and rushed to the house. The kitchen was so full of smoke that I couldn't see. The smoke was coming from a roast in the oven. Gasping for breath, I ran to the back door for air, and was met by a stream of water from the garden hose, in the hands of my husband, who thought the house was on fire. Finding it wasn't, he calmly put up the hose and went back to the shop to finish his work, leaving me to clean up the mess. The roast was a dollar and a half cinder. The potatoes were burned to the bottom of the kettle, the soup was glue. The asparagus looked like a box of matches that had accidently caught fire. And right in the middle of this, my husband sticks his head in the back door, and sweetly says, "Dinner ready?"

Workshops' ability to arouse and hold their owners' love is a never-failing source of amazement to me. The cosmetic makers ought to find out and pass on their wiles. As for me, I'm done, finished, washed up. I'm going to dress myself in black and start a crusade against home workshops, and mechanical magazines.

AMERICA IN 1950

IF THE JAPS WIN . . .

. . . Admiral Yamamoto already has announced that he plans to occupy the White House.

IF AMERICA WINS . . .

. . . the White House will continue to be occupied by men chosen by popular vote of the people.

Which occupant would you choose?

The number of War Bonds you buy now will signify your choice!

Your New Peacetime Home

[*Continued from page 57*]

of flexible screen. There are two 9x12 foot bedrooms, half a dozen closets, a bathroom and spacious kitchen.

Instead of thousands of nails, pieces of lumber, wire, and pipe, this house has been built of only 27 pieces. Each of these is a prefabricated unit for floor, wall, or ceiling. All the workmen have to do is bolt them together, which six men can easily do in an eight-hour day. What's more, out of these 27 units they can erect your house according to eleven different plans—a long house, a square house, or a house with all important rooms and windows facing the choice view of your property.

You learn that the floor panels are six inches thick, made of metal or plywood sheets separated by light metal trusswork and jam-packed with insulation. Wall panels are similar, but only four inches thick. Inside surfaces are of plywood, bonded (i.e., practically welded) to the panels. The warm finish never needs painting or papering and you can clean it with a dust cloth.

There are no radiators or hot-air registers. Instead, heat is pumped through inconspicuous ceiling ducts. Closets come in complete units, like the wall panels; they form interior partitions and help support the roof. Glass for the wall-high windows is set into the panels at the factory. You close yourself behind a bedroom door and discover that with all walls insulated you can't hear a thing that's going on outside.

A utility unit contains all plumbing and piping, factory installed in the panels. One side of the unit provides kitchen connections; the other, pipes for bathroom and heating plant. The house rests on seven concrete piers, formed by boring holes in the ground, setting in ready-made forms and pouring concrete. Lay six rectangular panels and you have your floor; 15 vertical units give you all walls, windows, closets and room partitions; lay six roof panels on top of these and you're ready to move in.

And how much will it cost? In mass production, about $1,950.

"I personally can see no way in which this tremendous housing need can be satisfied except by the industry supplying houses or parts of houses on a production-line basis," says designer Geddes.

Perhaps you would rather have your house delivered to you sliced like a loaf of bread. Government TVA engineers will accommodate you. They have designed a 30x22-foot house sliced into four three-ton sections. Each is a complete vertical section through a house: walls are in place, screens on the windows, refrigerators plugged into the walls, wash basins ready for use, even the electric bulbs screwed in!

Pulley wheels under the floors run along pipe tracks on the foundations and make it easy to roll sections in place. When all four sections are in position (naturally you'll be careful not to get the bathroom section in the middle of the kitchen) tie-rods are bolted together and you're ready for a housewarming party.

You get a preview of several of the best features of prefabrication in the house designed by A. Lawrence Kocher of Black Mountain College, North Carolina. It is based on prefabricated plywood panels and aims at a low cost—$2,000—to bring it within reach of almost any American family.

Instead of relatively small panels, several of which may be needed to make a wall, Kocher builds a one-piece wall as long as can be transported by truck. All windows, doors, and other equipment are in place in walls that will be the complete side or end of a house. A truck-mounted derrick is required to hoist these oversize units in place, but erection is very speedy. Instead of joining corner-to-corner, walls are butted up against each other at right angles.

You can visualize the idea by standing playing cards on their sides, joining the end of one card against the center of another, and so on. Better yet, cut out some cardboard rectangles so that you have a few long walls and some shorter ones, and see the variations in room arrangements you can make with only a dozen or so strips. Since no corners are joined, this method leaves you with several wall panels projecting beyond the house proper. Fine! Lay a terrace floor between

[*Continued on page 150*]

"With his new wrench Joe can tighten every bolt on your car from where he sits!"

these projecting panels and you have enlarged the living area of your house to include the garden.

Remember Grandma's highboy that she used for storing clothing? This Gargantuan chunk of furniture disappeared when the clothes closet came along to usurp its function. In a similar way, you'll get along with less furniture in the future because many pieces will be built right into tomorrow's houses.

"All but the small tables and chairs can be built in," says architect Gilbert Rohde, "thus assigning definite and well planned locations for the large units of equipment."

In short, much of your furniture arrangement is planned by an interior decorator who works with the architect. Conceivably, such items as dressers, bureaus and chests will disappear, their places taken by drawers, trays, shoe racks, adjustable shelves, and other appurtenances that come with your house. You won't have so many heavy furniture pieces to take along when you move.

Now we come to a startling idea that will knock the radiators right out of your home.

Imagine yourself sitting in your living room on a cold winter day. You are in your shirtsleeves, or the distaff equivalent, and you have thrown the windows wide open. Cold air is pouring in, but you're warm as toast.

Such things can't be! Yet they are, and seeking for the answer you wander around the radiatorless room and finally touch your hand to the wall. It is mildly warm, like a cup of coffee standing overlong. Surely that tepid temperature can't keep you comfortable with cold air swirling around you.

You'd be surprised! Among the laws you can't break is one from the physics books which states that a cold body always loses heat to a warm one. Temperature of the air separating the bodies is of little consequence. Therefore, when the walls, floors or ceilings around you are heated to 80 or 90 degrees, you lose very little heat to them and feel comfortably warm.

Ordinary radiators are first heated themselves, then they heat the air and the air heats you. Yet if the walls of the room are cold, you lose heat to them even though the air is hot, and can feel chilled in a room where the air is stifling. That is one reason why we often keep rooms much warmer than is healthful.

This new heating principle (which isn't new, for the Romans used it) is called "radiant heat," "radiant air conditioning," or "panel heat." It is absurdly simple. Instead of radiators or hot air registers, heating pipes are installed *inside* the walls, ceilings or floors. First cost is a little higher, but fuel expense drops about one-third, for walls cover large areas and need never be heated to radiator temperatures. Likewise, if you want to be cool in the summer time, remember that you're a hot body yearning to lose heat to a cold one. So you circulate water through the wall pipes, chill the walls, and are cucumber-cool even though the air in the room is blowing the top out of the thermometer!

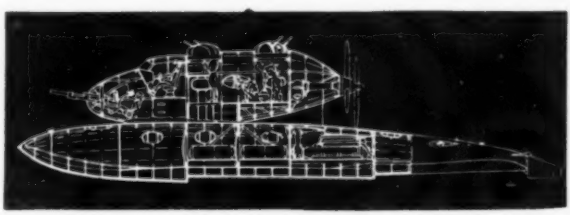
Both the shirtsleeves and the summer-coolness stunts may sound far-fetched, but Westinghouse scientists and experimenters at the University of Cincinnati, among others, have amply demonstrated that the principle works. Several buildings incorporating the radiant heat principle have been constructed, including the S. M. Johnson wax plant at Racine, Wisconsin, designed by Frank Lloyd Wright.

At least one manufacturer, the Revere Copper and Brass Company, plans the mass production of panel heating units for small homes after the war. Pipes will be built into prefabricated panels so that, when workmen bolt your walls and floors into place, they install your heating plant at the same time. The Revere company has made an extensive survey of all types of prefabrication and has published booklets giving full details of many of the house types described in this article. They will be glad to mail these pamphlets if you address a request to Revere Copper and Brass Inc., 230 Park Ave., New York City.

The radiant principle (which, by the way, explains why you're warmer in the sun than in the shade, although air temperatures may be the same) can be incorporated in other ways. Resistance units, similar in design to electric blankets, can be plugged in underneath your rugs to warm

STEAM P-T BOATS *that speed 100 m. p. h.!*

As heavily armed and armored as an M-4 tank, this new patrol-torpedo boat now on the board of one of the nation's leading aircraft designers will hurtle over the water to harass enemy warships 30 m.p.h. faster than present models! Read the complete details of their construction and performance promise in next month's issue of MECHANIX ILLUSTRATED! More pages, but still only 10 cents!



So Much for So Little!

Scores of New Projects Guaranteed to Keep Any Craftsman Happy . . . Every One Shop-Tested

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6 BIG ISSUES of this Craftsman's Magazine Crowded with New Projects, Plans, Ideas, Shop Helps

This unique craftsman's magazine is published 6 times a year—from October to March—during the months that every home workshop owner can best use it. It is crowded with exclusive new and different plans and ideas—plus hundreds of helpful, practical shop suggestions. Read this brief outline of the high spots—and mail the coupon below today! Here's what the Deltagram gives you in each issue:

New Designs and Plans—with complete working drawings and material specifications on the latest ideas in the wood, metal and plastic fields. The latest styles in furniture, picture frames, novelties, toys . . . and hundreds of other new and different motifs of design and construction. Easy to work out, accurate and carefully tested, these projects enable you to try your hand at a great variety of work.

One Evening Projects—specially designed to be completed in one evening. Hundreds of handy little objects usable in the home, office or shop. You get the complete story, layout and specifications so that you can start right in and with no trouble at all, progress step by step to the finished project. Ideal for the beginner, for children, or for the man who sells his work.

Special Shop Kinks—numerous shop kinks, and stories give you a world of ideas on how to get the most out of your tools. Short cuts to efficiency in the use of your tools, and much valuable information on technical subjects, a real service to the owner of a Delta equipped or other shop, are found in every issue of the Deltagram.

Shop Ideas—Job set-ups—machine set-ups—new and interesting ways of doing work. How to paint turnings on the lathe—how to do shaping with a double edge form—French Polishing—saw gumming with a grinding wheel—direct grinding of jointer knives—the cutting of Dentils. Ideas that will help you to do better work, and to overcome the many problems. Every story, every shop idea is aimed at your needs and demands.

Shop Activities—what are others doing—has some section a pet, new idea? What is going on in the North, South, East and West? Trade ideas with others. Keeps you in touch with current events in the craft field.

Whether you are a beginner or experienced shop man, you will get a lot of help from the Deltagram. Join with your friends in working on projects. Many a profitable and pleasant hour can be spent with ideas from the Deltagram. Trade ideas with others—Do new and better work—learn quick, easy methods of doing things. Get new plans and designs. Don't miss these six big issues of the Deltagram. Bigger and better than ever. Mail the coupon today.

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MILWAUKEE

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City.....

☐ Check here and enclose $1 if you wish 2 years' subscription (12 issues) of the Deltagram.

the floors. Or such units can be woven into draperies made of heatproof spun glass fabrics—when you want to warm up, just turn on the curtains!

We swing back to the house itself again with a glimpse at 5,000 prefabricated homes being erected for employees of the Norfolk Navy Yard by the Homasote Company of Trenton, New Jersey. Just to give you an idea, one of these houses has been erected in an hour and a quarter! The key building material is an insulating board made of mashed-up newspapers, chemically treated to emerge as a waterproof, fire-resistant, non-warpable wall structure. Remove some 200 lag screws and carriage bolts and your house is demounted.

Another gigantic proving grounds is the community at Middle River, Maryland, built for workers of the Martin bomber plant. Some 1,800 houses developed by the John B. Pierce Foundation and the Celotex Company have been erected, with more to come. A 4½-room house, complete with the exception of a few interior fittings, goes up in 35 man hours, or considerably less than a day with a six-man crew.

Here the wall material is Cemesto board, a product which furnishes in one piece the eight to ten elements of an ordinary wall: studding, plaster, lath, paint, sheathing, siding, etc. It is made by applying coatings of cement and asbestos to both sides of a slab of celotex, made from sugar cane fibre. These wall panels are laid horizontally, attached to a frame like a skyscraper. It is a "curtain wall"; i.e., it has nothing to support by itself. Posts support long beams on which the roof trusses are laid. The metal-hard surfaces require no painting, outside or in, and the only decoration needed is for doors, windows, and a small amount of trim.

Total cost for a complete two-bedroom house is estimated at $2,000. Bror G. Dahlberg, President of the Celotex Company, believes that the Cemesto house will make home ownership possible for America's 13,000,000 families with yearly income of $1,500 or less. After the war, he says, "The low-cost, machine-made house will play an important role. The war has enabled it to hurdle such peacetime barriers as pioneer distributing, winning public acceptance, costly initial selling effort and costly small volume production."

Perhaps the most conventional-appearing of prefabricated houses are those of the Gunnison Housing Corporation of New Albany, Indiana. They are white-walled, peaked-roof houses of New England or Mt. Vernon colonial design. Assembly-line methods are so well worked out that a single machine manufactures parts for one house in a little over three hours—and the house is packed on a freight car within two hours after the order reaches the factory.

The basic Gunnison panel is essentially a box girder filled with rock wool insulation. Surfaces are of hardwood veneers, laid cross-grain on the plywood principle. Between each layer is a sheet of thermosetting plastic. Baked in huge hot-plate presses, the result is a wood-plastic combination that is stronger than steel and permanently waterproof. These are bonded to the frames and the surfaces polished and coated with resin lacquers.

Johnny can use his crayons to draw cartoons on the walls; all you need for a perfect cleaning job is soap and water. You can throw things at them if you want to. Foster Gunnison, president of the company, delights in inviting visitors to do just that. He urges you to throw any sharp metal object against a panel and then defies you to discover where it hit. Panels have been submerged under flood waters for two years with no change other than accumulation of debris. In fact, they are routinely tested with boiling water. Toughies like this never require interior refinishing.

Many prefabricated panels, including the Gunnison type, incorporate the "stressed skin" principle. When you drive your car on a bridge the load isn't all on the roadway directly beneath; it is distributed along the bridge by the design of the girders. In a stressed skin house, stresses are not carried by the frame alone but are transmitted back and forth through the entire wall. Instead of hanging like lath and plaster as a dead weight on the studding, a stressed skin wall helps support the house.

This contributes tremendous strength. It is claimed that a Gunnison house will withstand a windload of 200 miles an hour instead of the 70 miles for a conventional house—something to think about if you live in a hurricane or tornado belt.

Gunnison houses range in size from four rooms and bath to eight rooms with two baths; you can have basements, fireplaces, arcades, porches, garages, and other optional features that make your home as individual as you please. Who said that prefabricated houses aren't flexible?

A straight-line house by George Fred Keck is designed to grow with the family. North walls would be windowless, with only a few ventilating louvres under the eaves. South walls would be virtually all glass, opening on terrace and garden to take full advantage of sunshine. Eaves of the flat roof project several feet beyond the glass wall. This acts like an awning to shut out summer sun, but permits the lower winter sun to

[*Continued on page 154*]

DO YOU KNOW WHAT'S A
SQUEEGEE GUN?

If you don't, better find out right away for they're the most important development in ballistics this war has yet brought forth! Read weapons expert Willy Ley's discussion of the gun which squeezes out bullets with more velocity than possible with the guns now generally in use by the world's armies. It's another of his authoritative, startling revelations on modern war-waging—and will appear in the December issue of MECHANIX ILLUSTRATED. Reserve your copy now! On sale November 6.

Craftsmen Attention!

HERE it is, you workshop fans! A big new edition of HOW TO BUILD IT No. 9, the famous manual that provides more entertainment and useful ideas for the home craftsman than any other book published. Crammed with plans and instructions for building more than 100 projects from wood, metal and plastics, plus handy kinks and hints on maintaining shop equipment, HOW TO BUILD IT, No. 9 is worth double its 50c price tag to any workshopper!

If you like to work with tools and make things, you won't want to be without a copy of this great book. Here is a partial list of the fascinating projects contained in its 146 profusely illustrated pages, and pictured at right above are some of the actual results achieved by following the clear-cut drawings and instructions: Phonograph Record Cabinet, Grinder-Polisher Combination for your Shop, Mercurial Barometer, Motorizing Your Bike, Rolling Lawn Chair, Pipe Drill Press, Making Your Own Micrometers, Wheelbarrow Seat, Pneumatic Target Pistol, 50c Welding Outfit, Year 'Round Sport Shack and many more items of varied types; furniture, games, lathe projects, plastics in the workshop, etc. Order your copy of the new HOW TO BUILD IT, No. 9 *TODAY* for only 50c postpaid. Use the coupon below. Or, if you prefer, ask your newsstand to reserve a copy for you.

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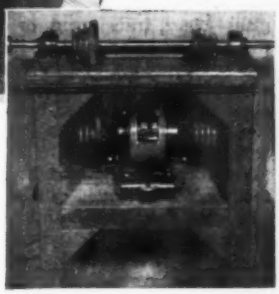

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contribute heat and cheerfulness in cold weather.

A strong flat roof permits summer coolness by carrying a thin sheet of water, or in winter, snow can pile up thickly for added insulation. Indeed, grass can grow on housetops: apply a layer of sod six inches thick and you have not only camouflaged your house from the sky, but have gone a long way toward insuring summer coolness. Basementless floors in the Keck house are warmed by panel heat.

But not every family wants a private house—what is in store for apartment dwellers? A complete new deal, according to Research and Planning Associates of New York. Stepping into a modern apartment building, you'll find that it offers tier after tier of empty floors. And we mean empty, except for supporting pillars: no partitions, no corridors, even no outside walls. You estimate the number of square feet of space you can use, sign a lease, and have your prefabricated partitions sent up.

With these partitions (which you can take with you when your lease expires, or trade in like a used car) you can arrange your rooms in any manner that pleases you. Outside walls can be of glass—clear, translucent, or opaque, according to the privacy or amount of light you want. Being easily movable, they can be set up at the outside edge of the building's floor in winter to enclose a room which, in summer, becomes an open-air terrace when the walls are rolled back eight or ten feet.

Partitions of lightweight sheet metal provide raceways for electric cables and plumbing pipes. You own your own bath and kitchen appliances. Service outlets with individual meters are connected to the central system. Louvres at the top of the wall sections control fresh air circulation.

Movability of partitions forecasts the day when housewives will be able to shift entire rooms about as easily as they now rearrange furniture. Tired of a small bedroom and a large den? Move a wall or two and you'll have a large bedroom and a small den. At present, prefabricated houses are not quite so flexible as this, but many of them offer telescoping walls or screens which enable you to enclose the dining space in a room when you are eating, and to thrust back the walls to make one large room of dining room and living room if you want more space for entertaining. As designer Raymond Lowey puts it, plans "will have greater freedom and less restriction as to definite room demarcations; with large glass areas tending to merge house and garden together."

Do you begin to get an idea of the housing that's in store for you? Not that your own house will necessarily include the exact features of the actual homes we have described. You will, for instance, be able to choose from other features not yet mentioned and from developments that as yet are experimental.

As, for instance, houses making lavish use of magnesium, aluminum, copper and stainless steels. All these metals are being produced in unimaginable quantity for the war effort and will some day be available for civilian use. They will, in fact, compete with themselves and other materials for consumer preference. Thurman Arnold, Assistant Attorney General of the U. S., foresees the day when light metal alloys will be so cheap that every house will have two bathrooms.

The frame of the house, its roof and its walls, are adaptable to the new techniques in metals. Imagine a house shell of welded magnesium so light that a few workmen can easily carry it. This isn't hard to imagine when you learn that one company is now turning out a welded freight-car body in a single operation. Thurman Arnold has stated that the cost of a house fabricated out of magnesium should not be over $2,000. One-piece metal fireplaces, chimney sections, kitchen cabinets and other parts replace, at a fraction of the cost, their handmade prototypes.

Interior decoration will make wide use of various plastics. Imagine window mouldings, mantels, plate rails, doorknobs, and other bits of trim made out of plastics as brilliantly or softly colored as you please. Some plastics such as lucite are luminous and contribute immeasurably to the cheerful brightness of a room.

Glass, an amazingly versatile material, is not limited to windows but is excellent for actual wall structures. In sheets or as glass brick, transparent or translucent walls will extend from floor to ceiling. The same thickness of glass is twice as efficient an insulator as brick, and just as resistant to a casually hurled stone. After the war, you may live in a glass house—and still throw stones if you want!

"Whew! It's getting stuffy in here. Let's go out in the pasture and get some fresh air!"

FAMOUS *Marlin* FEATURES

Marlin big game rifles—as well as the famous lever action .22—have featured the solid top receiver and side ejector since their introduction by Marlin a half century ago.

Marlin's solid top receiver permits *low mounting* of telescope sights, for convenience and accuracy. Case hardening adds to wear and beauty. Side ejection is safe and permits undistracted attention to your aiming.

Since early in 1942, engaged solely in war production.

These Marlin features have proved their value over the years. They are worth remembering after the war is won.

1870 THE MARLIN FIREARMS CO. 1942
NEW HAVEN, CONN., U. S. A.

Glass walls are important heating aids when they face the sun—you know how unbearably hot your car becomes when you roll up the windows on a warm day. Walls of glass brick with evacuated centers can be made to glow with beautiful colors when excited by radio energy.

Cotton is used in some prefabricated panels, bonded with resins and plywood. Anything containing cellulose—sawdust, wood chips, cotton—is raw material for a panel called Benalite made by the Masonite Company.

In many respects, the new plywoods are the most astonishing materials of all. Thanks to the development of strong waterproof glues, plywood can be glued to frames so that it is, for all practical purposes, welded.

"By gluing panels to the studding or joists instead of nailing them, the panel is made to assume part of the load upon the entire rigid member, instead of hanging as a dead weight upon the nails or fastenings. It is essentially the difference between welded construction and riveted construction," says I. F. Laucks, President of the I. F. Laucks Company, manufacturing chemists.

"In the construction field, adhesives that make a stronger bond than the metal used previously will prove stronger and better," promises L. T. Williams, President of the Franklin Glue Co.

Plywood can be "cooked" into any desired shapes in the process developed by the Vidal Research Laboratories of Camden, New Jersey. Plywood molded under liquid pressure and subjected to heat is now producing one-piece airplane fuselages in which the "skin" is its own structural support, requiring no braces or crossbars. Similarly, house walls can be cooked to shape with rounded corners that catch no dust. Elaborately carved wood members for interior trim can be made by cooking in moulds rather than by hand.

Of such things as these will your peacetime house be built. In this peek behind the scenes only the house structure and its heating units have been touched on. Even more startling things are in store in the way of equipment—warm wood bathtubs, dream kitchens, glass ranges, breathtaking new refrigerators, dust eliminators.

But that's another story, which you will find in the December issue of MECHANIX ILLUSTRATED.

Viewer For Small Slides

[*Continued from page 99*]

These measurements are noted and the lenses and the slide stage are placed in the viewer to conform to these distances.

The body of the viewer is built from pressed wood, although any thin sturdy material will do. The dimensions for the various parts are given in the accompanying drawing; but, it must be remembered that these dimensions for lens distances are only applicable to the lenses of the focal length mentioned above. Outside of this factor, all the other dimensions may be followed.

The back of the device is made from one piece. The sides consist of four pieces and the front of a single piece covering only the upper part of the apparatus. It is best to attach the two upper sides first. A length of wood ⅜-inch square will serve to make the spacers for the lenses, and also to attach the various sides to each other.

The two top cross-pieces are first cut and attached to the sides. The vertical pieces are then cut and attached as shown. The lens mounts should fit snugly between these spacers. A single screw on each side will make for rigidity as long as the whole assembly is made to fit snugly.

The slide stage was made from a single piece and a window cut out with a jewelers saw. If this is too difficult, the stage may be made in the shape of a square frame from four pieces. This also was made from ⅜ inch stock.

Two small channels are placed on the top of the slide stage as guides for the slides. The dimensions for these may be taken from the drawings. The slide stage is assembled along with the two lower sides.

The lower sides also hold the mirror for reflecting the light through the lens system. The mirror used was taken from a lady's hand bag. If one is not available, it may be purchased in a five and ten cent store.

The mirror is not attached in place permanently so that it may be moved to obtain the most light from any position. The mounting for the mirror is as follows: two pieces of stiff wire (piano wire) are fashioned so that there is an eye in the center and two hooks on either end. The wire mounts are clamped over the ends of the mirror and are held in place by their own tension. On one side, a machine screw is passed through the side of the viewer and a nut screwed on. The screw is then passed through the loop provided for it and another nut put in place. The hole in the side of the viewer should be large enough to allow the screw to turn freely. The two nuts are brought together against the eye in the wire (Figure 5). The screw on the other side is provided with a knob so that the mirror may be adjusted at the side of the box. This knob is made from the plastic cover of a medicinal tube. A hole was first bored in the cover; the machine screw was then passed through this hole and a nut driven down to hold the knob rigid on the screw.

After the upper and lower sections of the apparatus are assembled separately, both are attached to the back. The front of the viewer is made long enough to come down over the front of the viewer, but just enough to cover the lower edge of the slide stage.

Flat-head, brass wood-screws were used throughout, except for attaching the slide channels; small round heads were used here. A horizontal piece at the bottom of the back attached to it and the lower sides by screws makes this end quite rigid.

The viewer may be used in a vertical or horizontal position. Almost any light-colored surface, such as a wall, will throw enough light through the system to view a slide perfectly.

Automatic Record Changer

[*Continued from page 139*]

off the record pickup switch (Z) is opened and everything would ordinarily stop. However, by the time that happens auxiliary switch (3) has taken over and completes the circuit until lever (4) Fig. 4 opens switch; then both switches are open and the motor stops.

In other words, pickup switch (Z) starts the motor, auxiliary switch (3) immediately takes over and switch (Z) drops out of the picture until the next record. The record selectors which are located on top of the changer posts will require a bit of experimentation in order to determine their proper position. The records which are to be played should be resting on the bottom or lower selectors. When the changer posts turn the upper selectors, which are the thickness of a record above the lowers, move in and hold up the pile of records while the lower selectors shift entirely out of the way and drop the lower record. The two leads from the pickup go to the reproducing unit which may be an amplifier and speaker or a radio with the proper connections. It is also advisable to insert a switch in the line cord lead and mounting this switch in a convenient place for turning the unit on and off.

The Horse Comes Back

[*Continued from page 121*]

are beveled to assemble them at an angle, and hooves are merely painted on the rockers. Mane and tail are made from unraveled new hemp rope, and ear pieces of leather. Bridle is painted on, decorated with bottle caps, also painted red. The pony may be painted like a "calico" with large black and white areas, if the dappled cream is not preferred.—*Hi Sibley.*

World's 10 Needed Inventions

[*Continued from page* 36]

inventors with analytical minds able to improve the ordinary equipment we come in contact with in our everyday lives. Commonplace, imperfect devices may endure for years simply because no observing person has ever analyzed their imperfections and set out to improve them.

Tickets to the "inventors' sweepstakes" are free and everyone has a chance to win the big money. The maws of America's hungry machines, in war or out, must be fed with new gadgets.

A man stood waiting for a streetcar in Washington, D. C. He picked up a hairpin from the sidewalk, idly bent it around his fingers. It suddenly occurred to him that this piece of wire, properly bent, could be used to hold papers together. That marked the birth of the paper clip and a large fortune. That chap had never invented anything before in his life; like thousands of others, he was a one-shot inventor who struck it rich.

That happened years ago; but not so with Mrs. Anna J. Greenwich of Chicago, who had a jobless husband, four kids and a place on relief. She invented a clever new hair curler, sold it for a handsome figure, paid back her relief money, and saved the family homestead.

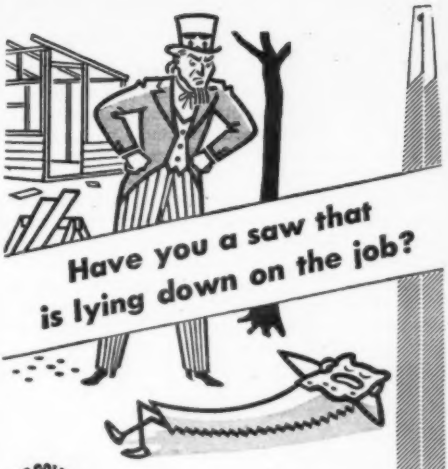
And there is the remarkable case of Grandma Birdora White, also of Chicago. Grandma White, aged seventy, was no female Edison, but she rang the bell with a new and better overall buckle. Then the Santa Claus who sits year round in the Patent Office left $350,000 in her stocking.

Every one of us rubs elbows every day with a hundred different things that either need to be invented or else perfected to a higher and more efficient degree: Take a lawn mower, for instance. Why not a machine that will sharpen itself, one that will remain in perfect adjustment once it has been set and one that will not pick up bits of wood and stone to clog itself?

Would that be an invention? It certainly would be, and it would be worth a million dollars. It does not take any special training or any special genius to find these things out. Any man may develop a critical attitude and upon looking at or using a device ask himself the simple questions, "How can this thing be improved?" "How can it be made more cheaply with fewer parts?" etc. It comes natural to every man to be more or less critical. It is born in the race and any phychologist will tell you that it is this critical attitude that is responsible for inventions.

Even as a man walks down the street he can see things that need to be improved upon. Electric signs, automobiles, trolley cars, baby carriages and a dozen other things meet his every glance. All he needs to do is to develop a habit of tearing these things apart and rebuilding them in his own mind. Every man is an inventor. We just can't help inventing. Every time we say something we have to invent a phrase of words to say it with. We are innately creative.

[*Continued on page* 160]



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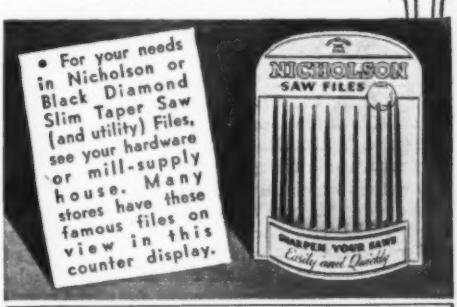
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Quad—Four-Runner Ice Boat

[*Continued from page* 120]

of the runner beams. Each rear runner has two springs in housings, while each forward runner has one. Rear springs and housings differ in size from the forward one and springs should be used as stipulated for balance tension. The tension of each fore spring is equal to the combined tension of both rear springs in each unit aft. This equalizes the pressure on each side runner brought to bear by the sail pressure; and balances the burden on each side runner.

These unique cushion-type springs are integral parts of the hobbler construction. Each rear hobbler is made of two pieces of 2½" angle iron, 12" long, with two square pieces of 3/16" sheet iron welded, as shown, to each hobbler set. In welding the space between the angle-iron should be accurately determined for properly fitting the runner chock.

Brass tubes, 1⅞" diameter, forming lower parts of the spring housing, are fused to the centers of the square plates. The upper section of the housings, into which the lower tubes slide, is essentially a separate part. The lower ends of the 2" brass tubes of the upper section are fitted into holes in a brass plate, and brazed thereto. Spacing of these tubes must coincide with the lower tubes.

The runner beam is drilled exactly to fit the upper tubes which are set in 3" from center of tube to outer end of plank. With ¼" holes drilled in the brass plate, it is screwed to the underside of the runner beam. Utmost accuracy *must* be exercised in drilling tube holes in the runner beams, otherwise runners will not align properly.

Four rear springs, 1¾" dia., 500 lb. tension, fit loosely with their ends bearing on housing ends. Each spring assembly is tied with studs through the hobbler and top tube ends, to prevent sliding out when hiking. *All lower tubes should be oiled or greased.*

The construction of each forward spring housing is basically the same. The lower 2⅜" brass tube is fused to the stipulated channel iron, which holds each runner. Brazed to the lower end of the top tube, the brass plate is screwed to the bottom side of the fore runner beam ends. Heavier springs with 1,000 lb. tension, are installed similarly with studs tying the housing sections.

The studs which tie the upper and lower tubular housings in this case are of at least ⅜" and preferably of ⅝" rod since these studs have to carry and transmit the steering strain. Lower ends of the front studs are welded fast to the front hobblers. Upper ends are secured to strap iron steering arms in the manner shown in the detail sketches. These outer steering arms are later connected by means of tie rods to the centrally located steering arm located immediately above and tied to the forward steering pulley.

The actual connecting links between the steering arms may be of ⅜" pipe, flattened or split at each end to afford a point of attachment to the arms. However a much better plan is to utilize ordinary auto steering rod with adjustable toggles (see detail of front steering post assembly) for these links. In any case the connecting links must be carefully cut or, if brake rods and toggles are utilized, adjusted so that absolute alignment of the front (steering) runners is maintained.

The front bulkhead (No. 1 on the plans) and the side planks will have to be cut out to afford clearance for the movement of the central steering arm and also for the connecting links or steering tie rods. The required cut can be established on the job.

Assemble the fore end in this order, after all steering parts are finished: First install the fore wheel with the tie rods leading out through the slots, bolted and lock-washered or cotter-pinned. Make sure that the steering cable leading to the cockpit wheel is safety-wired in the groove of the fore wheel. Then the fore deck piece is screwed to the sides, before putting on the forward runner beam. With each runner assembly installed, connect the tie rods to the cross-arms of each runner.

Dimensional details are given for fabricating the runners. Blades of old iron sheeting, with cutting edges beveled 45 degrees on each side, are recommended. Blades are set between oak chocks, which are riveted, to make up the thickness inside the hobblers. The average ice boater prefers wooden chocks for runners and hence, detail for such are shown.

With clearance over chocks, the runners are king-pinned in the hobblers with ½" machine bolts, with cotter-pinned nuts.

The mast size is shown in drawing and is glued up of ¾" spruce, with hollow between solid ends. The mast step is 12" length of 1" T-iron, screwed to the deck along the riser in the given position. The mast step has 5/16" holes drilled 1" apart for adjustment purposes. A U-strap is fitted to the lower mast end for bolting to the T-iron.

The mast is braced with five stays of 3/16" cable, adjusted with small turnbuckles. Each of the four side stays is anchored to eye-bolts through the outer ends of the runner beams. The fifth, a single forestay, is cleviced to a strap screwed to the butt of the bow.

Boom details are given. The grooved track (optional) is made by gluing two grooved strips, with ¼" spacing, to the boom. This requires making the sail with a bolt rope. However, brass Marconi ⅜" track may be used along both mast and boom for attaching the sail. Blocks for the ⅜" manila mainsheet are secured to the after deck, along the riser and in the boom as illustrated.

Straps for mooring the runner beam stays are fastened under heads of runner beam uprights. Brass straps 1/16" by 1" by 6" are screwed under the body ends for anchoring inner ends of hull

stays. Outer ends are secured to the runner planks as shown in the runner plank details.

Proper synchronization of the steering runners as well as perfect alignment of the rear runners are necessarily important to derive the best sailing. Rear runners must be equidistant, with the space between the cutting edges at the fore and after ends of the runners measuring exactly the same. Use a ten foot batten or a steel tape measure to check this.

After the steering cable is strung tight, check the runners. This should be done on the ice. Push the boat ahead, with the sail off, and make doubly certain that the rear runners track exactly in the groove of the front ones. If not, the fore runners are out of line, when the rear runners are squared to the hull. This calls for adjusting the tie rods, as required. With fore runners in longitudinal position, check the distance between the cutting edges for precise equidistance at both ends of blades.

List Of Materials For "QUAD"

BODY

Sides—2 pcs., ¾" by 9" by 17' spruce
Frame bulkheads—⅜" plywood, 1 sheet (small) and 40' of ¾"x1¼" oak
Ends—12 pcs., 1½"x12" pine
Riser—12 ft. of ¾"x1¼" oak
Stringers—32 ft. of ¾"x1¼" oak
Bottom—1 sheet ⅜" plywood, 48"x72"
Decking—1 sheet ¼" plywood, 48"x60"
Maststep—1 pc., 1"x12"x12" oak and 1 pc., 1"x12"x18"

RUNNER BEAMS

Bottom boards—2 pcs., 1"x12"x10'-0" spruce
Topboards—2 pcs., 1½"x12"x10'-0" oak
End blocks—2 pcs., 1½"x12"x12" oak or spruce
Truss upright—⅝" or ¾" spruce

MAST

2 pcs., ¾"x5"x19'-0" spruce and 2 pcs., ¾"x1½"x19'-0" spruce and 2 pcs., 1½"x3"x12" pine or spruce

BOOM

2 pcs., ¾"x6"x9'-3" spruce

REAR HOBBLER—SPRING UNITS

4 pcs., 2½" L-iron 10" long; 4 pcs., 3/16"x3¾"x7" sheet iron hobbler plates and 2 kingbolts, ½"x3¼" mach. bolt
4 pcs., 1⅞" br. tubing 7" long and 4 pcs., 2" br. tubing 7" long
2 pcs., ⅛"x5"x10" br. plate
4 springs, 1¾" dia., 10" long, 500 lb. compression. 4 brass studs, ¼"x11" long

FRONT RUDDER UNITS

2 U-shaped channels brass or iron (see detail), 2 kingbolts, ½"x3¼" machine bolts. 2 pcs., 2⅜" dia. br. tubing and 2 pcs., 2½" br. tubing all 7" long. 2 pcs., ⅛"x5"x5" br. plate. 2 springs, 2¼" dia. by 10" long, 1000 lb. compress
2 br. studs, ⅝"x12" long
2 cross-arms, ⅛"x2"x15"

STEERING GEAR

1 10" grooved cable wheel, with ⅝"x9" rod to fit
1 auto-type steering wheel with cable drum 6" dia. Four ⅜" tie rods about 60" long
Steering cable, 3/16" with small turnbuckle

RUNNERS

4 pcs., ¼"x6"x36" iron or steel sheeting

CHOCKS

8 pcs. ⅞"x3"x12" oak

[*Continued on page 160*]

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Quad—Four-Runner Ice Boat

[*Continued from page* 159]

MISCELLANEOUS

Stays—86 ft. of 3/16" cable; 14 sm. turnbuckles. 4 small eyebolts
Maststep—1 pc., 1¼"x12" T-iron
16 ⅜" carriage bolts for runner beam uprights
8 body bolts, ⅜"x13" carriage
2 pcs., 1/16"x1"x6" br. for hull stay straps
Marconi track—⅜" wd. 26'-6"
6 pulleys for mainsheet, with ⅜" sheaves
60 ft. of ⅜" manila rope
Also 4 blocks with beckets for deck and mast—mainsheet

Build with blueprints. MECHANIX ILLUSTRATED conducts a blueprint service for the convenience of its readers. You will find a partial list of available blueprints on page 34.

Build Inexpensive Bar

[*Continued from page* 134]

pine mouldings may be painted black. If, however, you have been lavish and made all the mouldings mahogany, they must naturally all be treated alike. A good waxing adds a nice finishing touch. Another finishing touch is a brass-foot rail. Try and get one. Otherwise wood will do.

The shelves may be left unpainted or may be given a coat or two of a cheery color. If they are to be painted it is wise to do the job before setting them in place, as it's much easier to coat both sides when you don't have to stand on your head to do it.

That's about all there is to it. To operate it, you just stand behind it. There will be a group of beaming, expectant faces looking at you from the other side. Cheerily at first, then mechanically perhaps, you reach down into the convenient shelves below the bar and keep removing bottles and opening them—your bottles. Those eager faces keep beaming at you and joyous conversation fills the air—for all the drinks are on you.

Inlaid Glove Box

[*Continued from page* 137]

molded sides and ends in one piece. A slip tongue strengthens the mitered joints and prevents slipping during assembly. Make a slotting tool of a nail with teeth filed in the head, to use in the drill press with the table set at 45°, with a beveled fence to guide the ends of the work. Feed against rotation, stopping before the molded edge is reached, and on the opposite ends feed the bit down (the depth stop having been set) just behind the molding.

When assembling the box it is wise to make a block to fit inside to prevent the clamps springing in the sides.

Size the top to make an even margin around the border and assemble with the lid pieces. Add the stops to the box, hinge the lid, and prepare for the finish. A water stain is ideal.

World's 10 Needed Inventions

[*Continued from page* 157]

There are hundreds upon hundreds of gadgets and improvements waiting to be invented—all of which will make fortunes. But looking broadly over the field of science and industry, what are the ten major inventions which the world needs the most?

In outlining what are considered to be the ten most needed inventions, the writer is hopeful that they will come to the attention of a large number of students of science and engineering.

Power is to the world what lubrication is to an automobile. It is the stuff the world "runs" on. We cannot produce energy in the strict sense of the term; we can only transform it. We burn coal to transform the solar energy that was stored in it millions of years ago. Man creates nothing. He can only change the things he finds in the earth.

Now in changing energy from one kind to another we are like a careless child trving to pour milk from one bottle to another, spilling most of it. We are wasteful but we must be forgiven because we don't know better. Since energy is the most fundamental thing in civilization today, the first most needed invention is one that will allow us to transform energy into power with less waste. Today we only succeed in getting about ten per cent of the available energy out of coal. The gasoline engine is only about twenty per cent efficient.

Why cannot electrical energy be produced direct from the heat of the coal without introducing any moving mechanism?

What is the second most needed invention? Any engineer with a sound knowledge of modern industrial conditions will hold that some method of storing energy is needed. The storage battery of today, although developed to a high degree of perfection, has low efficiency and the unit of power delivered after each charge is small compared to the unit of weight. If a small, light container for electric power were invented, transportation would be revolutionized. Say we had a device weighing about five pounds which would deliver twenty horsepower of energy for a period of twenty hours? The electric motor with its quiet running and high efficiency would almost immediately replace the unsatisfactory gas engine. Electric locomotives could be driven without the third rail and electric airplanes would take the place of the gas operated machines of today. The power of the tides is too erratic to be harnessed to the needs of industry. With an efficient storer of electric energy, we could build wave motors and tide-operated turbines which would follow the lunar cycles faithfully so that the general routine of industry would not need to be changed.

Although it may not be third on the list of importance, cold light must be considered as one of the ten most needed inventions of the day. Our present electric lamps give off only eight per cent of light. The remainder of the energy is wasted as useless heat—ninety-two per cent of it.

The perfection of a more rapid means of trans-

portation is without doubt an invention that really belongs in the list of ten. This does not necessarily refer to the perfection of the airplane. In this connection, the monorail is again suggested as a possibility. Then there is magnetic levitation which has been experimented with as a means of overcoming both the problem of friction and high traction power.

What is number five? The wireless transmission of power fills this space. Here, too, is a development that would not necessarily disturb our present scheme of utilizing power.

Great things would come to the human race if we should find a method for the transmutation of matter. It's already been done on a small scale in the laboratory.

Television, already an accomplishment as far as the solving of many major technical problems is concerned, may nevertheless still be listed among the ten most needed inventions because the industry is as yet in a stage comparable to the automobile thirty years ago—that is, the application of basic principles needs to be refined, streamlined, made practical in the mass. A personal television receiver that would fit into a vest pocket; a television attachment for the telephone so that you could not only see the person at the other end of the line but could also view documents, records, etc., involved in the conversation; television units that would automatically and permanently record both the visual and audio components of a conversation and thus serve the purpose of records, wills, contracts, and the like—these and hundreds of other applications mean that television, now an infant, will be a fruitful field for the inventor for a long time to come.

Artificial or transplanted eyes that would allow people to see might well be counted in with the ten most needed inventions. The same would be true in connection with a device that would overcome deafness.

The reader will understand that this is the writer's version of the ten most needed inventions. Of course, anyone is entitled to an opinion. In making the choice the writer was guided largely by what he knows to be the opinions of some of our greatest thinkers and research workers in the field of science. All of the inventions mentioned would have a far-reaching effect upon life in general and each one would bring greater happiness to people. That is the ultimate goal of civilization.

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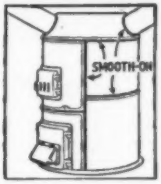

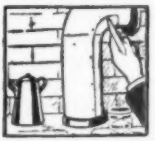

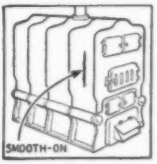

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The First Jaloppy

[*Continued from page* 125]

are also 3/16" wide and are bent to shape from a length about 4¾" long. Trim off any excess, and glue it so that it forms a full elliptical spring. Then glue the upper center to the side of the chassis. Don't put too many leaves in the rear springs or they will not give.

The rear axle is simply a length of dowel with a cylinder of balsa, representing the rear end housing, pushed over it and secured to the center with glue.

The front axle is made of ⅛" balsa and carefully cut to shape either from a single piece, or two separate pieces with the grain running crosswise. The top and bottom is finished off with 3/16" wide cardboard strips. Leave the ends of the top strip loose, for the springs are glued to the axle here. At each end of the axle there is a dummy steering knuckle and axle made out of piano wire (see detail sketches). They are bent to shape and glued in a niche in the ends to the wood axle. Make sure that they are of the same height. Check to make certain that they are even before the assembly is glued to the springs.

The top of the axle, where the cardboard is left loose is glued to the bottom of the springs, and then the cardboard strip is glued over it securely.

The rear axle is fastened to the center of the springs by a loop of No. 20 wire. Make the loop large enough so that the axle turns freely, but does not shift back and forth. Make sure that it clears the drive shaft.

If you are finished with the axles, you may place the bamboo or wire lengths that simulate the steering rod, tie rod, and brake rods, as well as the two that represent the torque rods for the drive shaft. Cut them to length and glue in position. You will find them illustrated on the plan.

The running board and kick-plate (back of running board) are made of medium cardboard. The running board is shown on the top plan of the chassis, and the kick-plate is outlined in dotted lines on the side view of the chassis. Cut them out and glue the kick-plate in the correct place on each side of the frame. When it has dried glue the running board to it, and hold it in place with pins until it is dry. See that it does not droop, and that both sides are exactly even.

The body is built in two separate sections. First the forward half, or front seat. This is cut out and carefully bent to shape. Notice that there is a bend in the sides of the front seat and back of the body. In other words, the seat is wider at the top than at the bottom, and sits almost 1/16" in from the outer edges of the side chassis frames. The forward part of the seat (sides of the floor) go directly against the lower part of the dash.

When the front half of the body has dried to the frame, you add the rear. It is cut out, folded and glued together. The floor is put in and the assembly is cemented to the chassis. Remember that the two forward sides of the rear go over the rear of the front seats to the dotted line. Then the front floor board is glued in place. The rear of the floor board goes directly below the place where the bottoms of the front seats are glued, and the front goes directly against the dash board. The two bottoms of the front seat, and the middle arm rest is put in place, and then the bottom of the rear seat is glued in position. The body is complete. Paint it now, before you add details. Then finish off the seats and edges with leather.

Two pieces for the backs of the front mudguards are cut out and glued to the chassis where the dotted lines on the pattern indicate. When they have dried to the frame, the fenders are cut out and glued over these backs and to the front edge of the running board. Make certain that they are both even and that the height corresponds with that of the plan. Hold them together with pins until they are dry. The rear fenders are cut out carefully and then glued to the rear edges of the running board and to the sides of the body, just about 1/16" below the fold of the body. Pin until dry and then bend the tips up carefully.

The top is built up of separate pieces of cardboard. The back is creased to represent folds, and then glued to the sides. A top and bottom is added and eight bamboo stringers, four on each side, which represent the shead braces. When all the parts are glued and are dry cover the assembly with leather, such as from a glove, and you have a neat folded top.

It is not necessary to go into the details for they will be found with all the necessary measurements on the plans. The front-rear and profile layout shows you where they go. Paint them before you put them in place.

Assuming that the details are finished, you may build the wheels. They consist of a cardboard rim, wooden match stick spokes, and two small disks of cardboard, the outer ones of the rear wheel being larger than the front outer disks. Over the wheel is a length of rope which simulates the tire. The construction is as follows:

Cut a length of caraboard ¼" wide and about 6" long, making sure that the grain runs crosswise. Curve it into a circle 1⅜" in diameter. Do this over some round object of the right size. Trim off the excess length and glue it together allowing a ⅛" overlap. When it is dry lay the rim on a flat board and carefully place 12 pins at even intervals around the outside of the rim. Do not push the edges of the rim inward.

Place a pin in the center of a cardboard disk, 7/16" in diameter, and pin it in the exact center of the rim. To this disk and to the rim, exactly where the 12 pins are, the spokes are glued, after they have been cut to the correct length. Allow them to clear the center pin about 1/16". When they have dried carefully remove the center pin

[*Continued on page* 164]

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Rockets In This War

[*Continued from page 45*]

of large and powerful powder rockets were secured to the framework, pointing downwards and backwards in an angle of about 45 degrees. The pilot of the bomber made a regular take-off run and when the plane was in motion, but not yet in the air, he ignited the batteries of rockets in the framework electrically. They furnished a strong push, lasting for several seconds only, but enough to lift the overloaded plane off the ground. The attachment then dropped off the fuselage, after the rockets had spent their power.

The Junkers Aircraft Company at Dessau took a plane of the *Bremen* type, but with pontoons instead of wheels and overloaded it to a gross weight of three tons. Part of the load was a battery of Sander rockets with one ton of thrust. The plane took off from a lake with little difficulty. It was this experiment, which was hushed up even then, that paved the way for the Nazi *Luftwaffe's* bomber device.

If the Nazi produced the first rocket weapon of the present war the British produced the so-far latest. Coastal convoys, they revealed, protect themselves with large powder rockets which are shot up into the air (and into the path of attacking Nazi aircraft) from the decks of the vessels. These rockets, upon reaching the peak of their flight, eject a small container filled with tightly wound steel tape, attached to a small parachute. The steel tape, as soon as it is released from the container, snaps open and begins to float slowly downwards, a very dangerous obstacle to aircraft.

It may be recalled that this principle was employed in an experimental anti-aircraft shell, details of which were made public in 1940. This shell, said to have been invented by an American, was tested by British authorities. The reason why rockets have been substituted for the shell have not been made known but can be guessed without much difficulty. The shell was said to have been of a six-inch caliber. This is larger than the ordinary types of anti-aircraft guns which measure from three to four inches across the bore. But a three or four-inch shell apparently could not accommodate a sufficient length of steel tape. In rockets the diameter of the steel tape container does not matter. Furthermore it is much easier to shoot off bunches of rockets then to send a large number of shells into the air in a very short time. And, finally, rockets can be released from very small vessels, while it needs a fairly large and sturdy ship to carry sufficient anti-aircraft guns.

The most important application of rocket power so far is, however, the rocket bomb, used by the Russians against Nazi *Panzer* columns and, in imitation of the Russian success, by the Nazis against Malta. The purpose of the rocket charge

[*Continued on page 164*]

in the bomb is mainly to make it penetrate the air faster so that it will hit its objective harder.

Early in 1941, while working on my book, *Bombs and Bombing*, it occurred to me that rockets might be useful in bombing strong targets. An airplane bomb, partly because of air resistance and partly because it does not have the push of projection from a gun barrel behind it, never attains a striking or impact velocity comparable to that of a shell. Calculation shows that a heavy bomb (say a 5-pound bomb) even when dropped from an altitude of 20,000 feet, does not strike the ground with more velocity than about 808 feet per second. Even a "slow" artillery projectile has about twice that speed, which means that it has about four times the energy of impact of such a bomb. A fast artillery projectile has approximately three times the impact velocity of the bomb, which means that it has nine times its energy. And when the bomb is released from a dive bomber the disadvantage of the bomb is even greater. It does not attain a higher velocity than about 500 feet per second and its energy of impact is, therefore, only one quarter of that of a bomb dropped from 20,000 feet.

The conclusion was obvious: a rocket charge, acting downward, would increase the speed and, consequently, the energy of the bomb. There was no doubt about this fact, but it remained to find out whether the gain in impact velocity would be quantitatively sufficient, whether a rocket bomb would be effective enough to be worth the trouble. A friend of mine, Herbert Schaefer, undertook the job of making the rather tedious calculations and the results, published in a jointly-written article in the December, 1941, issue of the *U. S. Naval Institute Proceedings*, proved that rocket bombs would show a superior performance.

A 210-pound bomb, supplied with a 12-pound rocket charge, when released from a dive bomber at an altitude of 1,000 feet, would need only 2.1 seconds (instead of 3) to strike the ground and would strike it with three times the energy of the rocketless bomb. The same bomb, released from 2,000 feet, would need 3.6 instead of 5.4 seconds and still strike about two and a half times as hard.

In addition to being faster such bombs would also be more accurate. The rocket action would straighten the trajectory to an almost mathemati-

[*Continued on page* 165]

AMERICA'S FIGHTING MEN *Attack!*

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The First Jaloppy

[*Continued from page* 162]

and glue the outer disk over the spokes. Then remove the 12 pins, and in their place glue a length of clothes-line, unwaxed, about the rim. This is your tire. Repeat the process on all wheels using the plan as a guide.

In the center of the two rear wheels, the ones with the larger center disks, drill a ⅛" diameter hole, and then make the brake drums, four cardboard disks 11/16" diameter, and glue them to each rear wheel, as shown. Also drill an ⅛" hole through the brake drum. The assembly is pushed over the axle, and glued. If, however, you notice there is too much side sway, before the wheel is permanently put in place, add a bit of tape between the spring and brake drum.

The front wheel center is widened with a pin, just enough to allow the wire axle to go into it. Wind some tape between the back of the wheel and the steering knuckle if it tends to shift. A drop of glue on the outside of the axle will serve to hold the wheel in place. Bend the axles so the wheels toe-in.

The spare tire made in the same manner as the wheels except that it lacks the center and spokes, so just make the rim and glue the rope around it for the tire. Though, if you don't mind the work you may make a whole wheel. The spare may go either on the left or right side. However, the left side is suggested because there are no gadgets or levers on that side and the wheel fills it in. It is glued to the wire tire holders, shown in the detail sketches.

Remember that the running board, and fenders must be a different color than the rest of the car, and do not try to paint the tires; leave them natural rope color.

An Old Fashioned Well

[*Continued from page* 128]

such as mixed nasturtiums, and a climbing vine.

If the well is filled with water it is wise to drain it before the atmosphere temperature drops below freezing in the winter. Provisions may be made for draining at the time the well is built, by chipping the corner from one of the lower bricks, and cementing a short length of pipe in the aperture. The pipe may then be plugged with a wooden plug or capped. If the pipe is capped it is well to coat the threaded portion with some corrosion-proof compound to keep it from rusting and thus making removal of the cap difficult. If the well is situated on a high point of the lawn, however, draining may be accomplished simply by siphoning with a length of garden hose.

The artistic effect of the well can be enhanced by using bricks of several different colors, as indicated in the drawing. While contrasting colors are not recommended, different shades of red create a pleasing appearance. This variation in color often makes it possible to utilize small quantities of brick left over from larger projects.

cally straight line (it is close to a straight line in dive bombing anyway) and the accuracy would be increased also by the fact that the bomb needed less time for its downward journey.

Just about eight weeks after publication of this article the Russians revealed that their tank-fighting *Shturmovik* (this spelling is closer to the Rusian pronunciation than the customary spelling *Sturmovik*) planes were equipped with rocket-accelerated bombs and did well with them. These bombs are said to weigh 100 kilograms (220 pounds) and to contain a rocket charge of five kilograms (11 pounds).

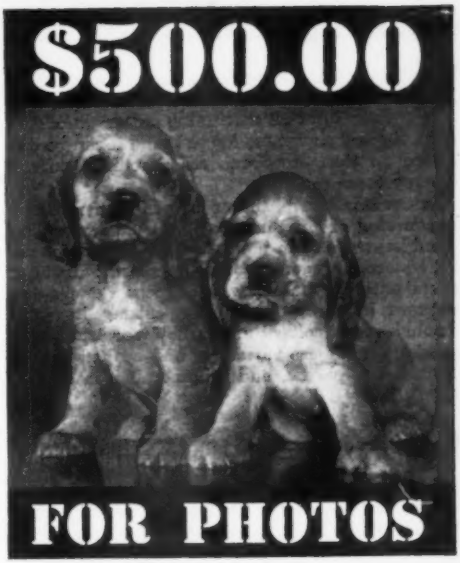
The Russians, incidentally, use rockets for tank fighting in another manner, too. As far as the secret has been disclosed they seem to have a kind of rocket projector, mounting a dozen or so thin-walled tubes on a gun-like carriage. The tubes are charged with powder rockets carrying high-explosive "war heads" and the whole salvo is discharged more or less simultaneously against attacking tanks. While a fast tank might be able to dodge a single missile of this kind, its commander is all but helpless against such a multiple discharge. (See drawing on opening page.)

There exists another possible use of rockets which might soon become actuality.

In 1905 the Swedish Baron von Unge suggested rocket-propelled shells as weapons for aircraft, not so much against ground forces but against each other. Baron von Unge had mainly airships in mind (it was the time when Zeppelin had scored his first successes) and the reason for his suggestion was that he wanted to save the weight of the gun. The idea was essentially correct, but then airplanes overtook airships and designers of airplane armament decided in favor of machine guns. Only Russian aviators utilized the suggestion during the first World War in shooting large fireworks rockets from airplanes against German captive observation balloons.

If anybody had any plans about such rocket weapons they came to nothing because of the development of rapid fire cannon for airplanes that made everything else look weak. But it is possible that these airplane cannons and rockets might be brought together one day. Airplane cannon have to have fairly short barrels, not so much because a longer barrel would be too heavy but mainly because the high muzzle velocity produced by a long barrel would react on the plane in the form of a nasty recoil. As a result the muzzle velocities of airplane shells are not very high and as a further result the battle ranges are limited. The battle range of the 37 millimeter airplane cannon (the gun of the Airacobra) is only about 600-700 yards. Beyond that distance the shell gets too slow, the power of penetration becomes too small to smash through airplane armor and the trajectory curves so much that aiming is difficult, if not impossible.

But battle range as well as power of penetration could be improved if the shells were equipped with a small rocket charge. (See diagram)



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Maybe Broaching Will Do It

[*Continued from page* 129]

broaches look like tapering files with overgrown teeth: others don't look like a machining tool at all! A broach, of all machining cutters, holds its accuracy and sharpness longest; and it can be designed so that numerous resharpenings do not destroy those qualities.

In the small shop, simple broaches operated by hammering or pressing may be used for cutting blind keyways as in the case described; for making square, hexagon, or other angular holes out of round ones; for making wrench sockets or shaping recesses in screw heads; for cutting keyways through gears, collars, and pulley wheels; and for making an endless variety of odd-shaped cuts in steel, brass, plastic, and innumerable other materials.

Simple Broach or Drift

Simplest of all broaches is a square-ended tool whose cross-section is the shape and size of the hole to be produced. Such broaches may be made from old chisels or from rods of carbon or high-speed tool steel suitably hardened. Suppose, for example, that you want to make a new socket wrench for a lathe chuck. The hole, in the end of a $\frac{7}{8}$" rod, is square, measures $\frac{1}{2}$" on a side, and is $\frac{1}{2}$" deep. Grind or mill a piece of tool steel or an old punch, chisel, or star drill until one end is exactly $\frac{1}{2}$" square. Beginning at this end, cut the four sides down until they taper slightly for a distance of about $\frac{5}{8}$". This is to provide clearance. Harden and temper the square end in the usual way. For ordinary chisels, etc., the following may be satisfactory: Heat to a bright cherry red and quench in salt water. Polish a test spot, reheat slowly until the spot becomes a fairly light purple, and quench in water or oil. Grind or hone the end of the broach and the tapered sides until keen cutting edges of exact size are produced.

In the end of the rod that is to become the new wrench, drill a hole slightly more than $\frac{1}{2}$" in diameter, to a depth of about $\frac{3}{4}$". Place the broach in position and hammer or press it into the hole to a depth of $\frac{1}{2}$". That's all there is to it! The extra drilled depth provides space for the metal, cut by the corners of the broach, to lodge; and the slight oversize in the drilled diameter is common practice. Hexagon and similar wrenches used with socket-head screws can be broken or cut and their ends ground to make improvised drifts or broaches for shaping emergency sockets. Usually these wrenches are already hardened satisfactorily, and care should be taken in grinding them to avoid overheating.

Multiple-Tooth Broaches

In the plant of the Atlas Press Company a quantity of small gears having splined holes had to be made. The teeth were cut in the blanks with gear shapers, but the splined holes were formed by broaching on a 5-ton arbor press. The broaches, shaped as illustrated, formed the splines by removing two curved segments, not quite semicircular in size, from the round holes originally drilled in the blanks.

High-speed steel was used for the pair of broaches, although regular carbon tool steel, carbon-vanadium steel, or any of scores of specialized types might have given good service. High-speed steel holds its edge longer and is less likely to warp in hardening than other kinds.

The broach blanks were machined between centers to exact length and 1/16" oversize in diameter. The tailstock was set over and each bar tapered. With a formed tool, the tooth relief was cut, about 1/32" of metal being left for later grinding. The slots or inverted splines, two diametrically opposite in each broach, were milled. The broaches were hardened by heating slowly to 1500 degrees Fahrenheit, then rapidly to 2,350 degrees; cooled rapidly in an air blast to about 1,550 degrees, then allowed to cool slowly to room temperature. Other kinds of steel, even different types of high-speed, would require different heat treatments.

The broaches were again mounted between centers, with the tailstock set over as before, and outside diameters ground (with a tool-post grinder) to within 0.002" or 0.003" of the finish size. The compound rest was swung 3 degrees and the relief angle cut on each tooth. At this stage, each tooth diameter was checked with a micrometer until it was the required size. The compound was set again, 10 degrees to the left, the grinding wheel form-dressed, and the front rake and fillets at the base of the teeth were ground. Serrations were formed with a surface grinder.

The standard 5-ton arbor press was checked for play in its ram. The photograph shows some dog-point setscrews that were installed to take up side play: front-and-back play is controlled by shims under the front plate. The jig or fixture made to hold the gear blank consists of a steel plate having a hole large enough for the broach to pass, with a recess bored around this hole to receive the gear blank. A hole was drilled in the end of the arbor-press ram to receive the upper ends of the broaches. With the help of a test bar, the hole in the ram and that in the jig were aligned; then the jig was bolted firmly to the press table.

The broaching process is simple: A gear blank is laid in the jig recess, the small end of Broach No. 1 inserted into it, and the upper end of the broach set in the press-ram hole. The ram is brought down, forcing the broach through the work and into a receptacle beneath the jig. This brings the hole in the gear halfway to shape. The second broach is pushed through the work in the same

[*Continued on page* 172]

Foto Freaks

[*Continued from page 97*]

paper, breaking both the emulsion and the fibres of the paper itself. But if a thin, glossy paper is used and the finished print is squeegeed after processing, this crease will usually be quite inconspicuous. However, while the print *can* be considered done at this stage, for really finished results, one should retouch the original folded print when it's dry, to eliminate, as far as possible, the evidence of folding. A copy negative can then be made from this retouched print on suitable copy film, the copy negative retouched, and the final print made from the copy negative. If the work has been done reasonably well, the final print will show very little evidence of the process used. Of course, the retouching will probably be evident on very close inspection, but at the normal reading distance it should be quite inconspicuous.

This is a contact printing process only, and is not practical for projection printing. In selecting a negative for this process, best results will be had if you select one with very strong contrasts, and then make the print on a rather soft grade of paper. This will minimize grain and tone variations.

Fold the paper together with the emulsion on the *inside*, then press the crease firmly together so the two halves of the sheet will lie as close together as possible, and place the folded paper on the negative in the printing frame so the crease bisects the part of the image you wish to use. Place the printing frame back on very tightly, and print as usual. You will have to make greatly increased exposures, as you will be printing through the back of the paper. This will necessarily give a somewhat softish, grainy print, but if made well otherwise, is not at all objectionable. Also, as the light must pass through the emulsion of the half of the sheet toward the light before it can reach the other half of the sheet, losing a slight bit of its power as it passes through the first emulsion, the "lower" half of the print is invariably a shade darker than the other half.

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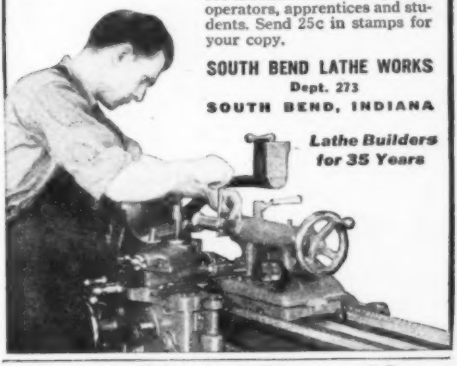

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Want To Find A Gold Mine?

[*Continued from page 65*]

of Pedro's map which went south into Sonora with Ramon and Manuel were bright threads in the amazing skein of golden disaster which Apache thunder-gods were even then weaving. For the towering pinnacles and sheer cliffs of the Superstitions were sacred ground to every savage who feared the lightning bolts and thunder and roaring floods which the angry gods sent down those deep, rough canyons. But back from Chihuahua City to those mountains Pedro Peralta came in the winter of 1847-48 with 68 men and 200 mules. Back to fortune—and death!

His miners spent almost a year first establishing mining camps, hewing timbers, wearing packtrails into solid rock, and digging feverishly in the gold-laden ore. According to their miner's signs, they found four more mines near La Sombrera. (I rediscovered one of them in 1940.)

But on an unlucky fall day enraged Apache warriors swarmed into the mountains that were god. Like an angry, frothing wave they swept over everything before them, slaughtered the astonished workers at the *arrastres*, picked off guards and packers. Then they were upon Pedro's hastily-mobilized miners in full fury. So reads the record of a Spanish spur, a fired musket thrown away in desperate haste, a heap of mule-bones, a grinning human skull.

The miners fought a desperate rear-guard action while Pedro's mules were burdened with foolish treasure. Atop the fabulous mountain which he had mapped the year before, Pedro hastily cut into solid rock as his memoranda of eight nearby mines, the Spanish miner's signs that my expedition first found in 1937. And then like chaff before a tornado he and the miners fled.

They flung themselves headlong into a trap!

Apaches were everywhere—hideously painted savages, screaming, fighting, killing. In hordes they drove the miners helpless against a cliff within sight of the present camp of Goldfield. From all sides came a deadly hail of arrows.

The Apaches promptly scalped their victims and looted the packtrain, thinking they had found a fortune in booty. But unwittingly they left a greater fortune behind—in yellow dirt which they dumped disdainfully on the ground.

After the massacre the Apaches appeased their thunder-gods by covering the mines, all but one which Pedro had just opened up, a mere shallow pit which was already so well hidden naturally that they thought it would never again be found. Four of the mines were on the black-topped mountain, the deepest fourteen Mexican ladders (about 70 feet). These were all so well covered by caliche-cemented logs well hidden under dirt and stones that no white man would ever find them. Or so in 1930 said an Apache who as a youth had helped to hide them.

Further up Needle canyon were two more mines near a hill upon which the Indians had erected a secret market—an eight-foot high rock placed upon the skyline of a ridge which jutted into the canyon to form an abrupt bend and the only south slope. This rock had been cut to look like a rampant horse's head which was only so

Correct Answers to Quiz on Page 78

1. False. They taste sweeter at room temperature.
2. False. Pumpkins are.
3. False. Unless atmospheric pressure is compensated, oxygen will not enter the blood at altitudes above 40,000 feet.
4. True.
5. True.
6. False. "Relaxation time" is time required for gas to come to equilibrium after being disturbed.
7. True.
8. False. The giraffe is totally mute.
9. False. It loses about 3 ounces in popping.
10. True. In 20 of the 48 states the brown-banded cockroach is considered a pet.
11. False. It is Stilton cheese; Stilson wrench.
12. False. It stores electricity momentarily.
13. False. A rattler may grow 4 buttons a year.
14. True. Under its skin.
15. True. Viridity is greenness or freshness.
16. True. Hogs cannot sweat.
17. True. Diesels have been run on powdered milk.
18. True. Because of centrifugal force.
19. True. There are more than 1,700 species of potatoes, most of which are poisonous.
20. True—when heated.
21. False. Vasomotor nerves control the size of blood vessels.
22. False. Clystron broadcasts power. Cyclotron smashes atoms.
23. True.
24. False. A chemical term.
25. False. A dessert.

Attention, MI Readers!

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Want To Find A Gold Mine?

recognizable at a certain place when approached from down canyon. Above this marker high in a steep ravine was the gold-speckled shallow pit while still another mine lay further up canyon to the east of Weaver's Needle. Strangely, it was this latter mine which I discovered in 1940 to verify the old Indian's story.

Would he guide a white man to the hidden gold? No, he said, for it was cursed with Indian blood and death would be certain. Vengeance of the thunder-gods did not fail.

But though the Indians had done their job well, they paid no heed to the markers and relics which my own expeditions found nearly a century later, and with which I rebuilt history and localized lost mine legend.

And yet that legend had hardly begun then. In far-off Sonora, Ramon had given his map to two miner friends! It was 1871 now, long years since Ramon and Manuel had left the Superstitions. Ramon had gone back to Chihuahua City upon the death of their father to look after family affairs. The map had been his parting jibe at the two German miners, Ludi and Jacobs, who had for some years evinced a skeptical interest in his tales of gold in territory which another government now owned. So more from curiosity than better reason, they trekked north to the Superstitions, to find, amazingly, that the map did match a region there. Doubtless, too, they found enough evidence of Pedro's presence to whip up their enthusiasm. And they hunted over the nearby hills until finally they stumbled upon the shallow bonanza which the Apaches had left uncovered 23 years before.

There they found fabulous ore such as even they had never seen before in the best of Mexican mining camps—golden rock that was almost a third metal! But even as they went to work upon it in joy, greedy eyes were watching. Jacob Walz, the Dutchman, and his itinerant carpenter partner, Wiser, on a prospecting trip from Florence, had camped nearby for the night and stumbled upon their secret!

This opportunity to gain possession of an apparently ready-made mine neither Walz nor Wiser could resist. Together they levelled their rifles upon the unsuspecting miners.

Next morning the Dutchman and Wiser returned to see their mine. But the two they had shot had vanished! Ludi and Jacobs, both mortally wounded, had fled in the night through the low pass at the head of Needle Canyon that would let them out of the mountains on the south. Ludi died en route, his remains later being found near Weaver's Needle. Jacobs, staggering on, finally reached the Star Brothers' cabin where he just had time to gasp out a tale of Spanish gold and hidden ambushers before he, too, died.

Back in the mountains Walz and Wiser were examining the mine in a frenzy of excitement.

[*Continued on page* 170]

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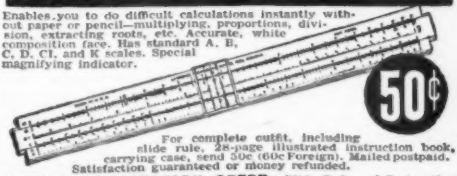

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Want To Find A Gold Mine?

[*Continued from page* 169]

But Walz thought of doubling that ill-gotten wealth—for himself. He shot Wiser, calmly left him writhing while he returned to camp, gathered up all of his partner's possessions and hid them under a nearby boulder in Needle Canyon, concealing forever, he thought, the evidence of his treachery.

In the meantime Wiser fled as had the two before him. Friendly Pima Indians found him wandering on the desert south of the mountains, more dead than alive, and carried him to Walker's Ranch near Florence. There for days he hovered between life and death, telling Colonel Walker his story of murder, fabulous ore, and treachery a little at a time. By way of proof he made a map which has existed to this day.

In the years that followed, the Dutchman occasionally vanished in the wild region around Weaver's Needle, turning up again and again with rich ore. Sometimes he would appear in Tucson where at least one reputable assayer admits handling his gold, sometimes in Florence or Phoenix. On one occasion in Phoenix he sold a burro-load of ore which, based on the weight capacity of the burro, proved it to be worth $10,000 a ton. Another time he staked Reinhart Petrasch, a pioneer business man, to enough to set him up in a bakery. And it was Petrasch who years later rescued the Dutchman from a tree during the flood of 1891, was present at his deathbed shortly after, and who is still alive to disprove as an eyewitness the stories of many imposters who claimed to have received the scret of Walz' mine. But Walz, himself, had already given out many clues inadvertently through the years.

During one drinking bout in Phoenix he told of a natural stone face sitting upon the end of a ridge in the canyon below his mine. This stone face, he said, looked upward toward a hidden arroyo in which his bonanza lay. The arroyo must have been open to the west for he was particularly fond of telling how the setting sun would glitter upon the ore. And, he said, he could easily see Weaver's Needle to the south by climbing a short way above. Nearby, too, was a cave in which he said he lived and stored a fortune in mined ore. As clues to this golden storehouse there are several rifle shells picked up in Needle Canyon which matched the now obsolete 45-90 Sharpes rifle he carried. Nor was the Dutchman the only one to bring gold out of this region during the eighties.

The best authenticated instance was that of two ex-soldiers just discharged from Fort McDowel. In 1873 they took a short-cut through the Superstitions on the way to seek work at the Silver King Mine. Somewhere near Weaver's Needle they, too, found fabulous ore, receiving $500 credit on the books of the Silver King Mine for the sample piece they sold there. And Jack Frazer, who was then the foreman who hired them, told me

[*Continued on page* 171]

Odd Corners For Frames

[*Continued from page* 132]

members securely while boring the dowel holes. A simple jig will do this.

Fig. 5—Another easy way of reinforcing a corner joint is to tack a piece of tinplate across it as shown. If you cannot hold the pieces securely enough, while driving the tacks, to prevent slipping, try putting the tacks in first, and then soldering the tinplate to their heads. The joint should be glued, of course.

Fig. 6—Among the more elaborate joints is this one secured by a ring connector. Clamp the frame pieces in a jig, and with a circle cutter like those used by radio men for cutting panels, etc., make a ring-shaped recess. The drill of the cutter will make a central hole too; and this should not extend all the way through the wood. Pour molten lead, babbitt or solder into the ring and the hole, and file any projecting metal flush with the wood. Another way is to slip a spring-wire ring over the wooden "button." Use glue on the wood surfaces of the joint, applying it before pouring the lead. The heat may affect the glue in contact with the metal, but won't damage much of it. Two or three brads driven into each half of the ring-shaped recess will secure the lead to the wood. Otherwise, the joint is separable if not glued.

Fig. 7—This is a fairly common method of reinforcing a joint by means of a concealed spline. The groove can be cut with a shaper, small saw blade, etc.

Fig. 8—Another way of using lead to unite wooden parts of a frame. Place mitred pieces side by side, edges parallel, and scribe marks across the mitred surfaces. Then, on these lines, bore holes as shown by dotted lines, centering them between back and front surfaces. With a drill, make two more holes at right angles to the first ones, and starting from the back surface. Pour lead into one hole, until it runs out of both of them. Wipe off excess metal with a block of wood before it hardens.

Fig. 9—This is another conventional way of making a splined joint, one in which the spline is not quite as well concealed as that in Fig. 7.

Fig. 10—A novel way of using short dowels to reinforce a joint is to bore two holes side by side from the back surface, to form a hole shaped like a figure 8. Make a plug to fit by slightly flattening two pieces of maple dowel stock, applying glue to the flat areas, and then nailing them together with slender brads.

Ideas For Service Men

[*Continued from page* 131]

ever cut anything! Why doesn't somebody think to send the soldier or sailor one of those efficient little Pike India or Carborundum pocket knife stones available at any hardware store for a quarter?

Want To Find A Gold Mine?

[Continued from page 170]

recently that they had described their strike exactly as "a reddish vein about a foot thick, halfway up a black-topped hill." Was it the same mountain which Pedro had mapped? *Quien sabe?* When their new employers sent them back to stake out a claim on it they were mysteriously killed!

Still remembered vividly out here is Adolph Ruth who arrived in Arizona in 1931 with an original Spanish map which his son had obtained some years before. In a letter to me Erwin C. Ruth verified his father's statements with the following extract: "The person I received the map from was a former Mexican consul to the U. S. by the name of Gonzales, a grandson of a Peralta. He claimed that the foundation of his family's wealth derived from the old Peralta gold mines in Arizona." So at last did Manuel's map come to light!

In June, 1931, Adolph Ruth went into the mountains with that map—and promptly vanished. Six months later his skull was found by merest chance, pierced by a rifle bullet! Apparently the map had led into the right region in which he said he would find markers and other definite clues to the mines' locations, for the rest of his remains were later discovered by a posse upon the eastern slope of the same black-topped mountain which it matched. And well hidden under a flap of his checkbook, and written a short while before he had been shot, was a startling note in Ruth's handwriting which said: "I came—I saw—I conquered. About 200 feet across from cave!" But to this day no one has found what he had discovered.

Again in 1937, Bill Jenkins of Phoenix thought the Superstitions would be a good place for a picnic, and took his family on a hike up-canyon from the Apache Trail. Among other mementos picked up by his wife and two children was a "pretty rock" which Bill broke open with a wrench when they had returned to the car. It was literally speckled with gold inside! One reputable Phoenix assayer to whom he showed it, estimated it as ore running over $2,000 a ton.

Fortunately I was promptly notified and had my crew on the trail within 48 hours, verifying his story by car tracks and the footprints of his family for nearly two miles—until a summer shower wiped out the trail to fortune. Then a trip which Jenkins had to make broke off my search. Later I made arrangements for him to join a mining expedition so we could find the proper region. But the day after he returned he died of heart failure!

Again and again in even recent years such occurrences lead to the inevitable conclusion that the lost Spanish mines and the fabulous Lost Dutchman are not the only possibilities for fortune in the Superstitions.

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Maybe Broaching Will Do It

[*Continued from page* 166]

way, completing the job. In this case, two broaches were sufficient to enlarge the hole from .3945" to 0.5005". For some jobs, a half-dozen broaches may be required.

Broaches will cut cleaner and easier and last longer if a cutting fluid is used with them. For steel and iron, a lard oil or a sulphurized cutting oil may be employed. Bronze and brass usually require no lubricant. Kerosene, turpentine, or a special cutting fluid may be used with aluminum.

Burnishing broaches have teeth that do no cutting but merely push or squeeze the metal into smoothness and exact size. Often the final teeth or diameter of a forming broach burnish the metal surface to complete smoothness. Usually the final half-dozen or so teeth on a multi-tooth broach are all the same size. These act to smooth the hole; but there is another reason for them: As a broach is resharpened, the starting teeth are reduced in size. Eventually No. 2 tooth will be the same size that No. 1 tooth originally was; No. 3 will become the size of No. 2, and so on. When the last cutting tooth is reached, it will have become the size of the next-to-last one. If there were no additional teeth, the finished dimension would be off. But by having several extra, full- sized teeth, there is margin for a great many resharpenings before the very last tooth has to be reduced in size. That is one reason why a broach, although costly to make in most cases, lasts comparatively longer and produces more accurate work than any other kind of cutting tool.

Multi-tooth broaches may be either pushed or pulled through the work. The push type has to be made comparatively short and stubby, for strength; and the length seldom is more than a foot or so. By using a series of short broaches, the same cutting capacity is obtained as with a single long one, but the time required for a complete cut is greater. For the average shop, push-type broaches are easier to operate with equipment usually at hand. The pitch or spacing of broach teeth should be such that at least two teeth are always in contact with the work. Frequently the broaching action holds the work firmly, and no special jigs or fixtures are required.

So the next time you have a difficult odd job to do or a quantity of parts to machine for some war-production plant, study the situation to see if broaching might be the best answer. From standard textbooks on shop practice you can obtain detailed information about the design, construction, sharpening, and use of broaches. In present-day war industries, broaching is reducing to seconds operations that formerly required minutes or hours. Perhaps it can do the same for you.

Yeast is now manufactured in several factories, substituting wood sugars in waste pulp liquor for the usual molasses as food for the yeast.

Wooden Block Trays

[*Continued from page* 133]

some walnut stain (if the wood is walnut or other open grain wood) and when this has dried, apply a coat or two of clear lacquer or varnish. Rub smooth with No. 4 steel wool, then lightly wax.

This completes the lathe work. On two adjacent edges of the block mark out in pencil on the unfinished wood, the outlines for the saw cuts as the dotted lines indicate. Now it is important that, for accurate band saw cutting, the block must be square on all surfaces; otherwise the saw cutting will be deeper on one side than on the other. So check for squareness carefully and if the block is slightly off, correct it on the sanding disk.

Open the throat of the band saw wide enough to admit the block on edge, then with a 3/16" or ⅛" blade, carefully make the first curved cut. This done, turn the block one-quarter over and make the next cut which produces neat, rugged legs at the four corners as shown. It is essential that about ¼" of wood remain between the top of the saw cut and the bottom of the lathe turning.

But little now remains to be done. With a drum sander, smooth up the curved saw cuts and with a sanding block covered with fine sand paper, smooth up the sides and top and apply the same finish as that given the bottom of the lathe turning so the whole piece will match.

Of no specific usefulness, this unusual tray will fit in just as other trays do—for candy, nuts, or cigarettes. And of course, the size of the block, the type of lathe and band saw cutting can be varied to produce an almost endless set of variations.

One of which is shown in Fig. 2. Here the block dimensions vary, being 3¼" thick and 4½" square. The methods are similar to those used in the first tray, but the lathe cutting produces a diameter of 3¼" and preferably but ½" deep. Also, the band saw cuts are more complicated, as the dotted lines indicate. In other words, three band saw cuts are made on one side before the block is turned over one-quarter turn for the next three cuts. And the result is strikingly different as you will note. After making the three cuts on one side, you should replace the waste with a sheet of paper to make up for the saw cut, to keep the block square while the next three cuts are made. This will prevent throwing the cuts out of line. Sanding and finishing are similar to that prescribed for Fig. 1.

These trays are also ideal for dresser use, to hold trinkets and jewelry and naturally make excellent gifts. The commercial-minded craftsman will see in them an idea which can be exploited through gift shops and drug stores at a good profit.—*Dale Van Horn.*

Underinflated tires are a cause of wasting rubber, and waste may run as high as 62%.

The bear's nickname, bruin, comes from a Dutch version of the word brown.

Workbench Maestro

[*Continued from page 77*]

antique benches, placed together, provide an odd, sturdy coffee table before the fireplace. For showing home movies, Waring opens a long panel near the ceiling and pulls down a movie screen from a hidden compartment.

In his kitchen, long stemmed glasses hang upside down from closet shelves, their bases slipped into grooved tracks which he worked out. His friends were surprised one day when he opened up a dining room table and folded it into a ping pong table before their eyes, while inviting them to a game! He had designed and built the table himself, and no one knew that it was a trick table until he unfolded it.

Auto-Focus Enlarging Easel

[*Continued from page 94*]

bottom of the square hole so the magnifying lens will be centered directly below the ground glass. The lens shown in the photograph is an inexpensive magnifying lens taken from an old flashlight. Any magnifying lens will serve, though the distance from the ground glass at which they will work best varies according to the focal length of the lens that is used.

So that the magnified ground glass image will be visible from above the easel, it is necessary to place a mirror below the magnifier at an angle of about twenty-two degrees from horizontal (see diagram), and then drill a ½-inch hole at a forty-five degree angle, through which the reflected image in the mirror can be seen. Remember that the centers of the ground glass, the magnifier, and the mirror must be kept in a straight line, and the imaginary center line of the ½-inch hole must pass through the exact center of the mirror.

The easel must be raised to allow space for the mirror underneath it. This can be done by fastening two boards of equal size under the easel with airplane model cement or wood screws.

Mr. "We Can"

[*Continued from page 69*]

Coast. Henry Kaiser had already had his eyes opened to his own abilities. It was no time at all until he was a "king pin" in West Coast construction.

"You don't let anything scare you," Kaiser has said, explaining his early successes. "And, especially, you try to get along with the people you work with."

That second statement is also an illuminating one. From the first, Kaiser has always watched his workmen carefully, trying to discover ways to make their work easy and pleasant for them. He was the first man, for instance, to put rubber tires on wheelbarrows. It made things easier for the "Poosh-'em-up-Johns"—and, incidentally,

[*Continued on page 175*]

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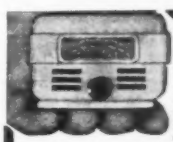

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Multi-Top Game Table

[*Continued from page* 136]

kind of wood as the rest. If maple or birch were used for the framework a birch, maple or even gum plywood could be utilized.

Start with the legs. You will need stock at least 3½" square. One can glue up stock to this size if necessary. The finished leg is 3" square at the top, 1½" square at the base. The taper can be most easily cut on the bench saw. Most craftsmen are familiar with the jig used for this job but for those who may not be, a drawing illustrates and explains its use.

The width of the taper is in this case ¾" so the steps on the block will be that wide. The length of the taper is of course the length of the leg, that is 28".

After the tapers have been cut on four sides of the leg another must be made along the inside corner of the piece. In order to hold the stock in the correct position to cut a taper along the corner of the leg it will be necessary to cut a wedge shaped piece to ride along the ripping fence and the table. This is lightly attached to the leg with small wire brads. After this inside taper is cut, a chisel and gouge are employed to work this into a V shaped groove from the small end of the taper toward the top of the leg, where it is widened out and curved to form a part of the circular aperture in which the carom pocket is hung. This is indicated clearly in the drawing. This drawing shows a ⅜" mortise, 1" long at the top of the leg on each side where the rails join. Dowel construction can be used if preferred, but in either case the dowels or tenon should be 1½" long in order to make a good strong joint.

The side rails for the main top are next prepared. The finished rails are 1" wide and 2" deep. Sketch shows the location and depth of the rabbet that accommodates the rim of the upper board when it is in place; also the groove that is cut to take the ¼" plywood top of the carom board. Tenons are cut at each end or dowel pins inserted as the case may be.

The plywood top board is next cut and fitted. The circular aperture for the pocket is 3½" in diameter. Part of this circle is formed by the curved surface of the leg and the rest cut from the board top. A shallow groove must be cut in the edge of the plywood around the circle and likewise in the curved part of the leg so that the wire that holds the top of the pocket can be fitted tightly into it. The top, the rails and the legs are next sanded thoroughly and then may be assembled and glued. It will probably be best to assemble two sides and when the glue is set to join these two sides with the other rails. The rim is so narrow that it would be hard to place the clamps and properly draw the frame together all at one time.

Now for the top game board. This is a rather simple job. The rabbeted rails are mitred at the corners and the use of a spline would help. The plywood top is fastened in place by glueing and small brads which should be slightly countersunk with a nail set. All joints and cuts on these rails must be very accurate if it is to fit down correctly on the permanent table top. It is likewise imperative that the materials used be thoroughly dry, or they may warp out of shape and not fit. Sand all the parts and assemble.

You are now ready for the finish. If the wood requires it a filler is first applied and this is followed when dry by a shellac sealer coat. The sealer coat is lightly sanded and then the checkerboard and carom board are laid out with black enamel. Now put on one or two good coats of varnish.

The playing pieces can be purchased almost anywhere but you can make them if you wish. For the checkers turn down a spindle about 1⅛" in diameter and sand well. Mark off into correct spacing for separate checkers and make a slight cut between each one and the next with a spear point. Saw apart and sand, then paint as required. For the carom playing pieces turn down a similar spindle, same diameter, in a good hardwood like maple. Mark off in proper spacings and turn beads. Saw apart, sand and paint.

About the carom pockets! Almost any sort of meshed net material will do for these. A piece of minnow seine is good or any similar fish netting. If one is acquainted with the method of weaving cord netting employing the sheet-bend knot and done with a netting needle, he can make his own meshed material.

All-Year Play Cottage

[*Continued from page* 143]

that admits sunlight to every corner of the interior. By judicious use of insulating board around wainscoting, under the unglazed portion of the roof and under the floor, warmth will be retained on sunny days in the coldest weather. Storm windows can be added to the north side, and ventilation is provided by a tilting window at one end.

In locating the structure select a site unshaded in winter, and the glazed half of the roof should face the south. If a larger house is desired, simply expand the floor-plan dimensions. Construction for the most part is standard practice with the exception of the glazing and the removable portions of the roof. The latter consists of three sections with cleats which sit down between the rafters. Patented siding, preferably redwood because of its lightness, is used for the roof. This has about one-half inch lap and lies flat on the underside, assuring a neat job. Construction details are shown in Fig. 2, Fig. 3, and assembly of the roof is illustrated in Fig. 4. Other material than that specified can be used if more readily available, and dimensions adapted as required.

Mr. "We Can"

[*Continued from page* 173]

it paid out in time-saving dividends to Kaiser. Today, his enterprises are run on a completely "closed shop" basis. Kaiser gives his workmen everything they want—as long as they keep producing the mammoth things he wants to build.

Other businessmen have frequently criticized him for his extremely liberal labor policies, claiming he "spoils" his workmen. Kaiser thinks otherwise. If you give the workmen what they want, he believes, they will give you what you want, too.

Apparently, Kaiser is right. Never once have Kaiser's operations been interrupted by a strike!

Machines and men and big ideas. From the first, this combination worked successfully for Kaiser. He got his real start on highway construction contracts.

He was the first big construction man who discovered the magic of diesel engines. When equipment manufacturers would have nothing to do with diesels, Kaiser bought the biggest road building machines he could find and put powerful diesels in them, himself. The diesels tore a good many of his machines apart, but Kaiser kept puttering with them until he made them work. A good share of his success in this matter came through his friendship with Bob Le Tourneau, who has since become the world's biggest builder of big construction machines. Le Tourneau, who is known as "Tobin Bronze Bob," because of the welding rods which are always sticking out of his pockets, could satisfy Henry Kaiser's overpowering yen for BIG machines—but only to a somewhat limited extent. For, in the early years of his construction history, Kaiser earned a nickname, himself. He was known as "Sideboard" Kaiser, because of his penchant for building sideboard onto his already huge power shovels in order to increase their capacity.

With his mastery of big machines and his ability to soothe wild-eyed engineers who looked at Kaiser blueprints and immediately started to scream, he made a breeze of his three biggest dam projects.

Kaiser ran up against his greatest disappointment when, after completing Grand Coulee, he failed in his bid for the Shasta dam in California. Another contractor bid a few dollars below Kaiser's price.

This was enough to arouse Kaiser's fighting spirit. His reaction was typically Kaiser. He immediately set out to "build the dam out from under" the successful bidder. He did this by first succeeding in getting the contract to supply all the sand and gravel for Shasta. Then he got the contract to deliver the sand and gravel, beating the Union Pacific Railway's bid by building a conveyor belt that carried the sand and gravel 10 miles over mountains to the dam site!

His venture into the cement business was a result of this same effort. Never having been in-

[*Continued on page* 176]

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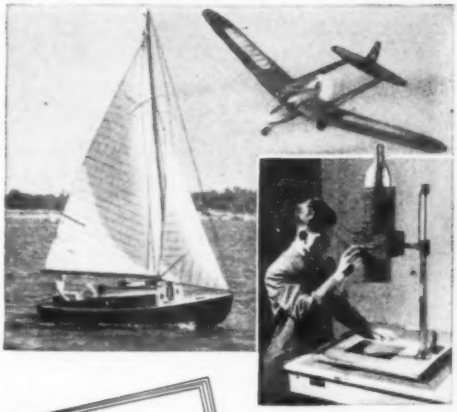

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Mr. "We Can"

[*Continued from page* 175]

side a cement factory, he bid for the cement contract at Shasta and obtained it. His success, mentioned above in this article, caused a tremendous upheavel in the cement industry and brought down cement prices over the whole nation.

When the Axis started sinking U. S. ships faster than they could be built, Kaiser thought it was about time he took a hand in the matter. To him, 10,500-ton Liberty ships are just so much heavy material to be "handled."

To this day, Kaiser still speaks of the stern of a ship as the "back end." Perhaps his very lack of knowledge of ship-building methods account to a large extent for his success.

When he got his first contract to build Liberties, he looked over a few shipyards and saw how hulls were turned out piece by piece, torturously slow, on the way.

"That's just pitiful," he said.

Kaiser went to the West Coast and bought property for three large yards. Then he started building ships "all over the place."

He built them in huge sections, with the stern section taking form perhaps a mile away from the bow, and the deck and cabin maybe another mile away from that. He wheeled in some of his mammoth cranes from the Boulder Dam and Coulee jobs. When a section was complete, a Kaiser crane picked it up bodily and set it on the way.

When his welders complained that it was hard to bend over all day long while welding, Kaiser characteristically ordered his ships built upside down, and rolled them over when they were finished.

"It's easier," Kaiser explains, simply.

Apparently he is correct again. For Liberty ships are now being turned out at the rate of one a day.

And, whereas it formerly took 194 days to build a Liberty ship, Kaiser recently turned one out in 98 days!

Now, Kaiser is all airplanes. He foresees a day when ponderous cargo planes, built of light metal alloys, will network the world for the U. S. A., carrying America's products to the far corners of the earth and bringing prosperity to all races.

Howard Hughes, the 36-year-old designer and airplane speed king, has joined with Kaiser now to plan and build these great cargo planes. They are a pair to watch carefully.

"Of course, we have to win the war," Kaiser says, his eyes becoming a bit dreamy. "But our job isn't just to win the war. When you think of China and India and those countries, you realize our job is to rebuild the world!"

And don't tell Henry Kaiser we can't do it. Because, by gosh, we can!

All of the world's Great White Herons—about 800—are in Florida.

Easily-Built Home Shop Desk

[*Continued from page* 144]

the top, if found necessary. Of course, the back of the desk may consist of one single section. In some cases this may be desired. Do not use any wood thicker than one-half inch for this purpose unless, for some special reason, you want unusual ruggedness. A lighter desk is probably more desirable in most instances.

After you have assembled the main parts, that is, the three uprights, back and stationary half of the top, you may go on to the finishing details. The adjustable half is used, obviously, as a drawing board which may be adjusted to any angle. The hinges are indicated. One or two supporting arms may be installed, as shown. The shelf for blueprints and folders and the book-shelves should be first assembled, to exact dimensions and then inserted and fastened, with smaller screws, in the left section. Adding the veneer bottom provides drawer space; many of you will want to utilize this feature. So too with the book ends. Perhaps you already have book-ends, but the pair shown are recommended because they fit in with the "organic style" of the entire unit.

In completing a job, the last touch is the "finishing" touch. A small can of varnish-stain in the color you prefer will complete this useful and desirable piece of shop furniture. Naturally, many of you will have your own ideas about doing this project. But, here is the skeleton structure. You can add or subtract according to your preferences and abilities.

Coaxial 2½-Meter Antenna

[*Continued from page* 146]

the pipe. On examination it will be seen that the whip is fed by one feeder and the cylinder by the other feeder; the coaxial properties being assumed by the pipe and coaxial wire leading to both halves of the dipole antenna.

The pipe can be supported vertically by threading into a socket in a base well insulated from the place to which it is attached, or two long and sturdy stand-off insulators can be bolted into the side of the cylinder and then fastened to the mast or house gable.

Use any length feeders constructed from No. 14 copper wires spaced 1½ in. apart by UHF spreaders. Take up strain of feeders from the antenna by insulators a few feet below. In using higher frequencies be sure they are nearly exact multiples of the fundamental frequencies for which the antenna is constructed.

ANSWERS TO QUIZ ON PAGE 145

1—2 to 1 ratio
2—SOS-I; XXX-Urgent; TTT-Safety
3—Ash
4—Cedar
5—Annealing
6—40,000 lbs. per sq. in.

1-Minute Developer Test

[*Continued from page* 93]

It may be necessary to make several test exposures to determine the correct shutter speed and lens opening—one that will produce a fully-detailed result on the film being tested. When the standards have been set, it is only necessary to examine the detail and contrast of "check negatives" of the standard subject as the developer is progressively exhausted. As soon as weakness of shadow detail or lack of highlight density is evident in comparison to the standard "fresh developer" negative, it is time to throw away the developing solution. It is assumed that developing time is increased after each successive role developed in keeping with the developer manufacturer's instructions.

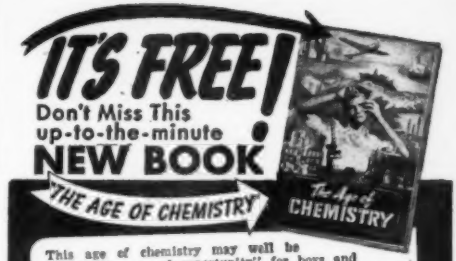
A good check negative that will always be under standard illumination can be made in a few minutes by sandwiching a good, well-exposed and normally-developed negative between a sheet of clear glass and a sheet of opal glass cut to the size of your darkroom safelight filter. Properly bound, this sandwich can be slipped into the normal position of the filter in the safelight frame with an opal enlarger bulb behind it (instead of the 10, 15, or 25-watt safelight lamp).

To make the test negative, the photographer places the illuminated negative at the end of a yardstick with the camera at a distance that will produce a fairly large image on the negative frame without requiring the use of supplementary close-up lens attachments. The illumination of the negative in the safelight frame is always the same no matter what the camera distance, however, since the distance between the lamp and negative is always constant.

The writer's procedure produces a fully-detailed, positive transparency on the negative strip used for the developer test—not a negative image. By the same token, the standard, fresh-developer, check negative is also a positive transparency. If the photographer wishes to have his check negative come out as a negative on the film strip, he must use a good positive transparency instead of a negative in his safelight frame, as a standard subject. The negative was used by the author because the making of a positive transparency means an extra step.

It is important to use the exact developing routine each time, following the time and temperature table faithfully. This will eliminate faulty development with good developer through your own negligence.

With a No. E-11 Super-N-Larger bulb or a G.E. No. 212, the author found that the following standard check-negative exposures did the job at f/16: for films with a 16 Weston, tungsten rating—1/25th second; for 32 Weston—1/50 second, and for 64 Weston—1/100 second. Variations in your negative, camera shutter, and safelight lamp may require a different exposure for you. So, use these figures as a guide in making your own standardization tests.



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Bing Crosby's Victory Lab

[*Continued from page 73*]

five weeks during which that man slaved day and night. When he came to Prager's office again, he had a dial with some complicated connections which add up to this: when ice begins to form on the wings, the propellers, or anywhere on a plane, the pilot becomes instantly aware of the new conditions. At precisely the right time, not too early and not too late, the de-icing boots automatically begin pulsating to knock the ice off, and keep the plane flying at the desired speed. For military fliers especially, those called upon to penetrate long distance into enemy territory on bombing missions, this will mean happy return home for many who otherwise might be lost.

Unlike the usual conception of a laboratory or workshop, no array of test tubes and machines greets the visitor at the Crosby offices. That's exactly what they are, modern business offices. They serve as a meeting place and clearing house. The inventors work at home, and occasionally in a commercial laboratory somewhere around Pasadena and Los Angeles. "The day of inventing for the sake of inventing is passe, for the time being," Prager tells every would-be producer of a new artifact. "We're interested only in inventions to promote the war. We know what the needs are, and if your idea looks good we'll bring in trained scientists to help out." If the idea is developed, the laboratory charges one per cent of the royalty for its services. Frequently, the labor is for love of country only, because the government doesn't pay royalties.

But fighting men are beginning to learn that the brothers Crosby and their Mr. Prager are performing yeoman service in their behalf. For example, there's a gold plated mirror device that helped halt Nazi raids in England. This little secret picks up the infra-rays from the planes' exhausts. In conjunction with range finders, the mirror helped bring down 180 German planes in a single night.

And there's a blind pig. Not an ordinary flesh-and-blood porker, but a super-miniature tank packed with 25 pounds of explosives. Two men can lift it into place, start it going, and remote-control radio steers it to the enemy, and explodes the TNT in their faces, perhaps on the edge of a machine gun nest, or at the foot of a big gun. It's really a baby tank, capable of blasting the daylights out of whatever it hits.

Other inventions have come from the laboratory group. A target plane with a stabilizer which keeps it flying on an even keel while anti-aircraft shells explode and machine-gun bullets plow through its fabric. A high frequency pickup, or plane detector, which is non-electrical, which funnels into its throat high frequency vibrations at the instant of origin, instead of seconds or minutes later. An electric hydrometer, which records continuously the specific gravity of any liquid or gas. This one finds particular value on submarines, for it tells the commander at a glance how much power remains in his batteries.

The list isn't long, but it's growing. Larry Crosby insists that everyone shall be heard, and when a need arises he swings into action overnight to meet the demand for a new item, or for increased production. Here's an example: a West Coast aircraft needed more castings, fast. Crosby heard about the situation, and shortly had added a foundry to the list of the Crosby developments. One day the foundry-to-be was known as an abandoned bus depot. Next morning, cleaners were hard at work dusting out the cobwebs. Within a few days the Major Aircraft Foundry was going full tilt. Larry is president and brother Bob, the orchestra leader, a stockholder. Already, the foundry, with a weekly payroll of $16,000, is finishing 40 different aluminum parts for North American and other plane manufacturers.

Larry and the other boys, working day and night inventing to beat the axis, hold their fingers to their lips when you ask for details. What's coming? Just a hint—a ground speed indicator said to make accurate bomb hits a mathematical certainty. A magnetized drafting board that keeps instruments from falling off when a destroyer or airplane bucks. An airplane engine described as twice more efficient than anything flying today.

Where are the blueprints and the models? Secrets. Several times thieves have broken into the Crosby offices. All they got for their trouble were a few letters from crack-pots. To those, Axis agents are welcome.

"A car didn't run over your pancakes, Paw, them's waffles!"